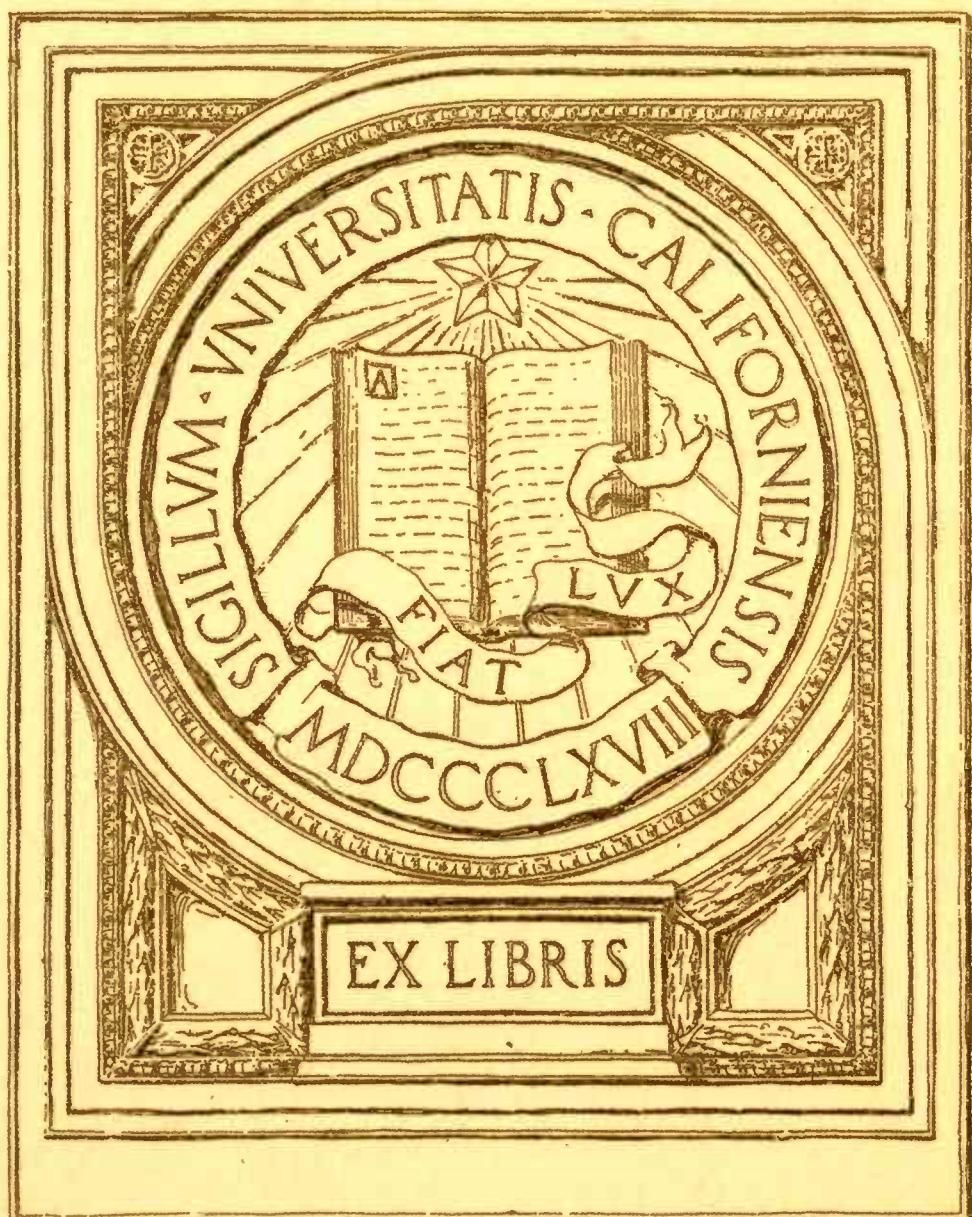
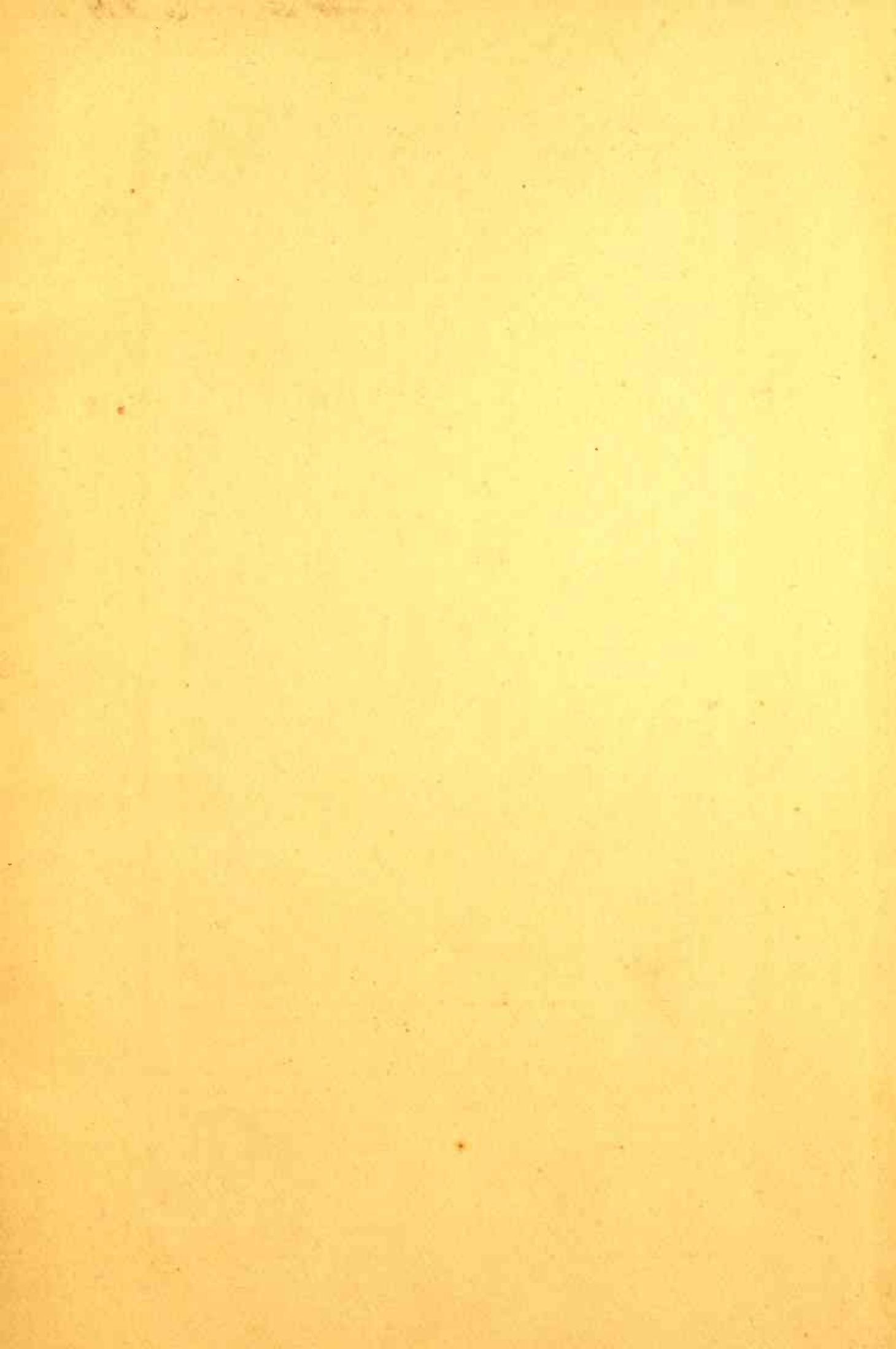


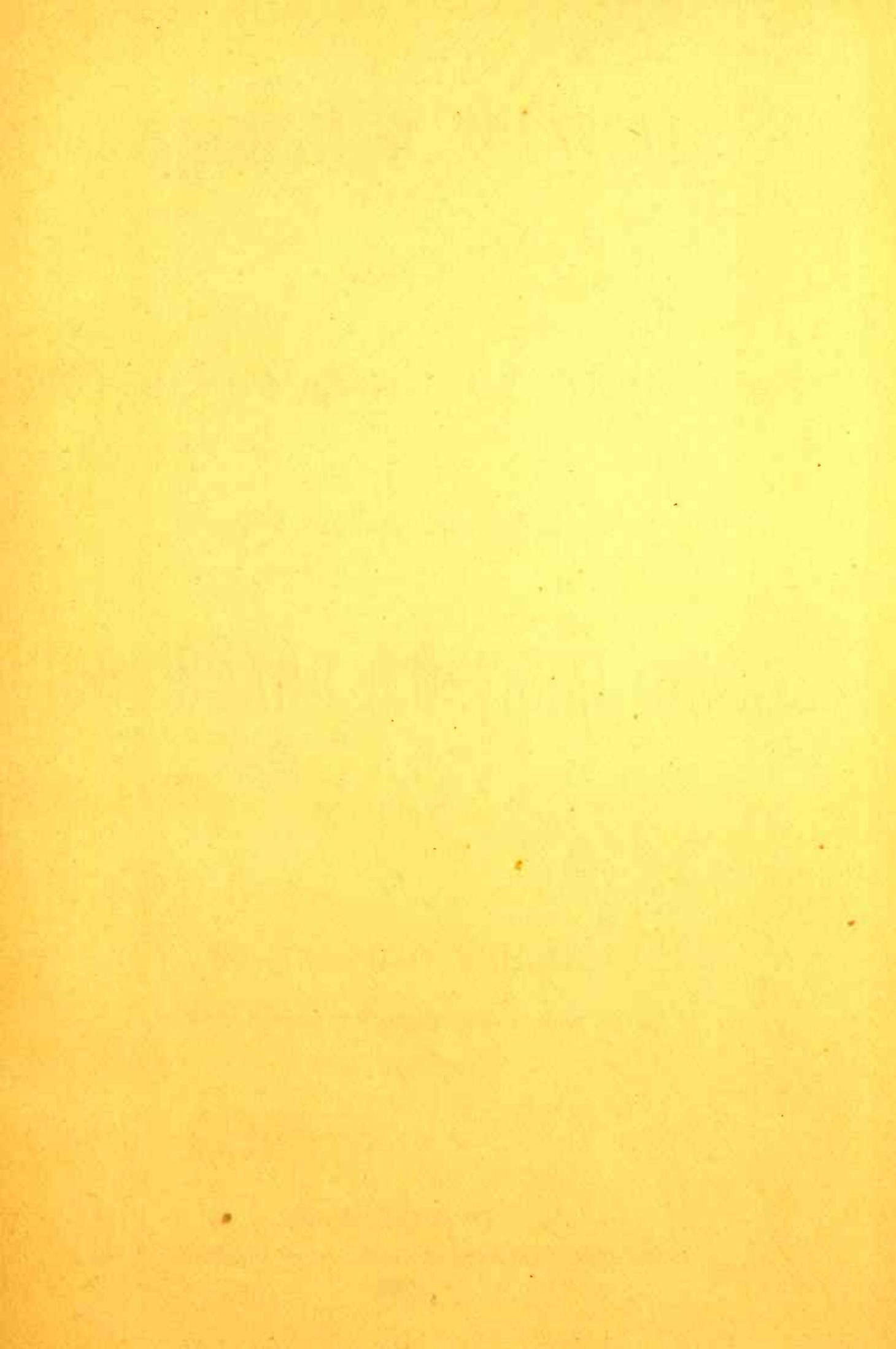
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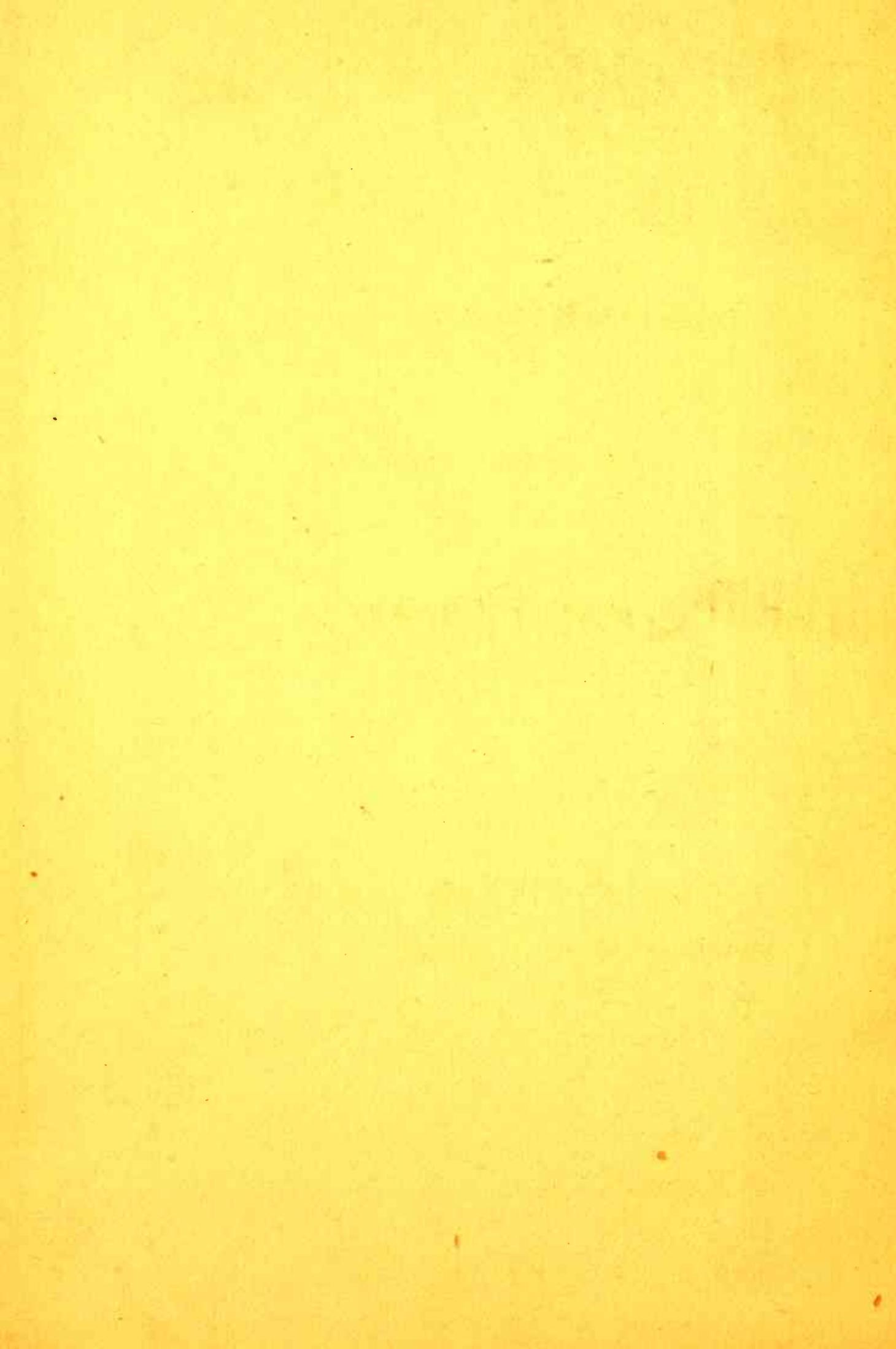
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# TEACHERS' MANUAL,

OR,

## THE BEST METHOD OF TEACHING

THE NATURAL HISTORY OF

# INJURIOUS AND BENEFICIAL INSECTS

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BY MATTHEW COOKE,

LATE CHIEF EXECUTIVE HORTICULTURAL OFFICER OF CAL.

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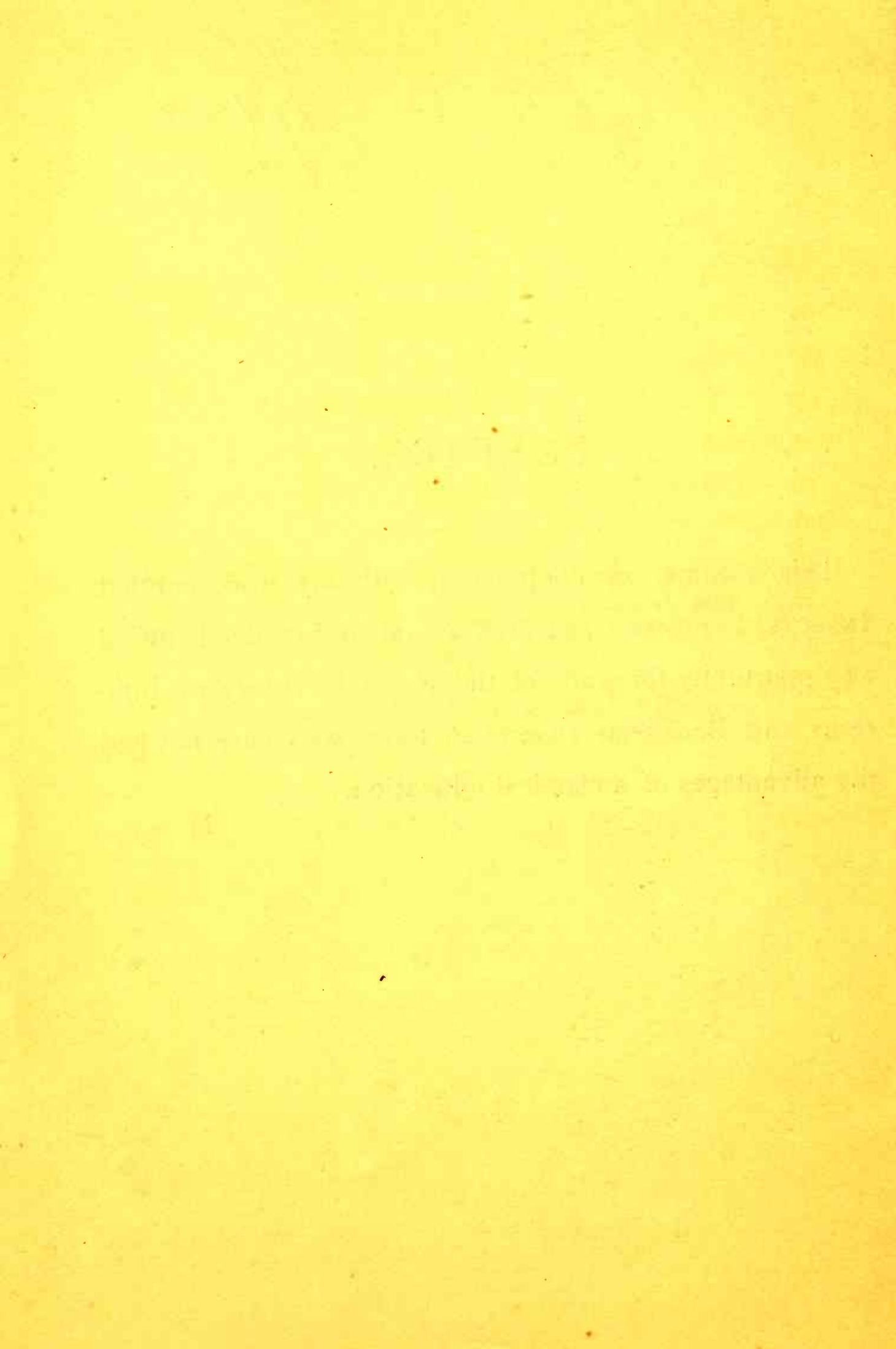
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## PREFACE.

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This volume, in conjunction with my work entitled **INSECTS, INJURIOUS AND BENEFICIAL**, is intended to afford an opportunity for study of the Natural History of Injurious and Beneficial Insects to those who have not had the advantages of a classical education.

M. C.



## TO TEACHERS OR STUDENTS.

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The illustrations given in the text book, "Insects, Injurious and Beneficial," number nearly seven hundred, and may be classed as follows :

1st. Illustrations representing the insect, etc., about the natural size. Examples: Figs. 4, 9, 16, 17, 19, etc.

2d. Illustrations representing the insect, etc., enlarged. Examples: Figs. 15, 20, 38b, 41c, etc.

The accompanying lines in these illustrations indicate the natural length of the insect. The cross-lines, as in Figs. 185, 188, 189, etc., indicate the natural length of body and spread of wings, etc.

3d. Enlarged illustrations of minute insects, etc., the natural size of which cannot be given by lines; the natural length is given here in fractions of an inch. Examples: Fig. 5, 1-30; Fig. 10, 1-50; Fig. 13, 1-40; Fig. 29, 1-20; Fig. 42, 1-22; Fig. 305, 1-25.

4th. Enlarged illustrations, in which the lines indicating the lengths of insects are absent; Fig. 46, 4 to 16 lines (see Glossary\*); Fig. 47, 4½ to 6 lines†; Fig. 56, 1 line†; Fig. 63, 2 to 7 lines†; Fig. 64, 6 lines†; Fig. 129, highly magnified; Figs. 186, 187, 333 and 334, about size indicated by cross-lines in Fig. 188. Fig. 264, 1½ to 2 lines†; Fig. 306, 1 to 3 lines†.

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\* Line.

† Natural length.

5th. Illustrations in which the enlarged and natural sizes of insects are given. Examples: Figs. 12; 24, 1 and 3; 135; 157, 1 and 3; 164.

6th. The student should be required to comply with the following rules:

*First.*—To give answers to all questions in writing, except such as are required to be memorized.

*Second.*—To learn to draw on blackboard, etc., the appendages of the head, thorax and abdomen of insects.

*Third.*—When commencing the study, to learn only the common names of insects and their several parts, except the technical names not enclosed in brackets.

*Fourth.*—When reviewing the work, to learn the technical names inclosed in brackets. (See table of technical names.)

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## TEACHERS.

In schools where my book, "Injurious Insects of the Orchard," etc., is in the library, the teacher should consult it and teach, orally, the remedies given for the extermination of injurious insects. Example: on page 65 of text book, Fig. 196 represents the Achemon Sphinx. On page 179 of the former can be found a description of this species, and Remedies Nos. 14, 33, 100 and 101 are given.

This course should be followed in all public schools, regardless of other study of natural history, on account of the importance of the subject upon various branches of industry of the State.

# TEACHERS' MANUAL.

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## CHAPTER I.

Question—What does the Science of Entomology teach ?

Answer—The natural history of insects.

Q.—By what name are the divisions of the Realm of Nature known ? A.—Kingdoms.

Q.—Into how many Kingdoms is the Realm of Nature divided ? A.—Three.

Q.—Name them ? A.—Animal, Vegetable and Mineral.

Q.—Name some specimens belonging to the Animal, Vegetable and Mineral kingdoms ?

Q.—Into how many sub-kingdoms is the Animal kingdom divided ? A.—Four.

Q.—Name them ? A.—1st, Back-boned Animals (Vertebrata); 2d, Jointed Animals (Articulata); 3d, Soft-bodied Animals (Mollusca); 4th, Star Fishes (Radiata).

Q.—What characterizes the Animals belonging to each of the four sub-kingdoms of the Animal Kingdom ?

Q.—To what division of sub-kingdoms do Insects belong ? A.—To the second, or Jointed Animals.

Q.—What is meant by *Articulata* ?

Q.—By what terms are the divisions of the sub-kingdom which comprise the Jointed Animals known ? A.—Classes.

Q.—Into how many classes is the sub-kingdom divided ? A.—Five.

Q.—Name them ?

Q.—Wherein do Animals described in each class differ from each other ? A.—In the number of legs they possess.

Q.—How many legs do the True Insects have ?

Q.—How many legs do the Spiders, etc., have ?

Q.—How many legs do the Crabs, Lobsters, etc., have ?

Q.—How many legs do the Centipedes, Millepedes, etc., have ?

Q.—Have Earth Worms legs ?

Q.—What examples can be given in each case ? A.—1st class, Figs. 1 and 4 ; 2d class, Figs. 5, 9 and 10 ; 4th class, Fig. 6 ; 5th class, Fig. 7.

Q.—Into how many regions is the body of a true insect divided ?

Q.—Name them ?

Q.—Into how many regions is the body of a Spider divided ?

Q.—Wherein does the body of a Mite differ from that of a Spider ?

Q.—What examples are given ? A.—Figs. 9 and 10.

Q.—Are Mites always provided with eight legs ? A.—No ; when young they have only six legs.

Q.—What example is given ? A.—Fig. 11.

Q.—To what class do Scorpions belong ?

Q.—By what common name are the Centipedes and Millepedes known ?

Q.—Into how many groups are they divided ?

Q.—By what characters are they readily distinguished ?

Q.—Name the group which is considered beneficial ; also the group which is considered injurious ?

Q.—Define the term Insect ?

Q.—What examples are given to represent the rings, segments, etc., by which the external skeleton is divided ?

A.—Figs. 1, 2, 6, 8 and 14.

Q.—To what class do winged insects belong ? A.—To the first class.

Q.—Through how many states or stages do insects pass?

Q.—Name them?

Q.—What are the changes from one state or stage to another termed? A.—Transformations (or *Metamorphoses*).

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## CHAPTER II.

Question—What is the first state or stage of insect life?

Q.—What is the usual form of insects' eggs?

Q.—What examples are given of the different forms of the eggs of insects, and name them? A.—Figs. 25-31, inclusive.

Q.—What term is applied to those insects which deposit eggs?

Q.—What is meant by the term Oviparous?

Q.—Name some insects which do not deposit eggs, but which bring forth their young alive?

Q.—What term is applied to them?

Q.—What is meant by Viviparous?

Q.—What examples are given in relation to the places where insects deposit their eggs, and describe them? A.—Figs. 27, 28, 30 to 40 inclusive.

NOTE.—The questions should be asked separately as to each of the figures in the text.

Q.—Name some of the insects which deposit their eggs on the foliage of trees and plants; on grasses; on wheat stalks; in wheat stalks; in the ground; on the bark of trees and plants; on fruit; also those which make an incision in the leaves of trees, etc., in which they place the eggs?

Q.—What provision is made by the oviparous parent insect for the protection of their young?

Q.—Of how many parts does the egg of an insect consist, and name them?

Q.—In what manner are the eggs of insects attached to foliage?

Fig. 20—c, represents the beak or sucking mouth of the insect.

Fig. 23—a, larva; b, pupa; c, fly; h, tarsal claws; i, antennæ; hair-lines, average natural length.

Fig. 24—2, winged plant-louse; 4, wingless plant louse; 1 and 3 represent natural size.

Fig. 25—Egg of a moth ribbed.

Fig. 26—Egg of a butterfly, checkered.

Fig. 28—Branch; a, eggs deposited in pith; b, punctures made by insect through which the eggs are deposited; c, egg magnified.

Fig. 30—Currant leaf; 1, eggs; 2, 3, holes made by the young larvæ.

Fig. 31—a, larva; c, pupa; d, eggs.

Fig. 34—a, showing punctures made by insects; b, irregular longitudinal row of eggs placed diagonally across the pith (unlike those of Fig. 28); c, egg magnified.

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### CHAPTER III.

Question—Name the second state or stage through which insects pass?

Q.—What is meant by larva?

Q.—By what other names or terms are the larvæ designated?

Q.—What is meant by worm-like?

Q.—Are the larvæ of all insects worm-like?

Q.—Name some of the insects whose larvæ are not worm-like?

Q.—In what respect do they differ from the perfect insect or parent?

Q.—Name some insects the larvæ of which are worm-like?

Q.—What are the divisions termed into which the body of a larva is divided?

Q.—How many segments, or rings of the larva, represent the thorax of the perfect insect, and what are they termed ?

Q.—What segments or rings represent the abdomen of the perfect insect, and what are they termed ?

NOTE.—The first segment is the segment or ring next to the head ; the divisions of the body of the perfect insect are represented in the larval state by the head, thoracic segments, and abdominal segments ; the last or posterior segment is termed the anal segment.

Q.—When there is a horny plate on top of the first segment, what is it termed ?

Q.—When there is a horny plate on top of the twelfth or last segment, what is it termed ?

Q.—When there is a horn, or spine, on top of the eleventh segment, what is it termed ?

Q.—What is the back or upper part of the body of a larva termed ?

Q.—What is the belly or under part of the body of a larva termed ?

Q.—Where are the breathing pores or spiracles of Caterpillars located.

Q.—By what terms are the lines on the body of some Caterpillars designated ?

Q.—Where are the dorsal, stigmatal and sub-dorsal lines located ?

Q.—Describe the appearance of some of the larvæ of Butterflies and Moths, and name the examples given ?

Q.—When a larva is destitute of legs, by what common name is it known ?

Q.—Name the example given ?

Q.—How are Caterpillars designated ? A.—As True Caterpillars, or as False Caterpillars.

Q.—Describe the characteristics by which True Caterpillars are known, also those by which False Caterpillars are known ?

Q.—What are the legs attached to the thoracic segments termed ; also those attached to the abdominal segments ?

Q.—What are the legs attached to the anal segment termed ?

Q.—What figures represent the pro-leg of a Caterpillar ?

Q.—Describe a pro-leg ?

Q.—What common name is given to Caterpillars having only four, six, or eight pro-legs ?

Q.—From what do they derive their name ? A.—From their mode of locomotion.

Q.—When larvæ are destitute of legs and apparently headless, what are they termed ?

Q.—Name the examples given ?

Q.—In what state or stage of life do insects increase in size ?

Q.—What are larvæ termed which have only six legs, and to what kind of insects do they belong ?

Q.—Describe the example given ?

Q.—Do Butterflies or any other insects increase in size after their wings and other members have acquired their proper form and degree of firmness ?

[The pupil should be taught the difference between the pro-leg of a True Caterpillar, having from ten to sixteen legs, and that of a False Caterpillar, having twenty or twenty-two legs, the former having a hook on the tip, the latter having none.]

Q.—What is meant by dorsum ; venter ; piliferous ; tubercle ; thorax ; abdomen ; spiracle ?

Fig. 41—*a*, larva; *b*, pupa; *c*, perfect insect.

Fig. 42—Larva of Thrip, (natural size, one twenty-eighth of an inch in length).

Fig. 43—*c*, egg; *b*, larva; *a*, pupa.

Fig. 52—Cut-worm and joint showing piliferous spots, enlarged.

Fig. 60—*a*, *a*, *a*, larva; *b*, enlarged joint of body showing black tubercles.

## CHAPTER IV.

Question—Name the third state or stage through which insects pass?

Q.—What is meant by pupa?

Q.—What other terms are applied to the third state through which insects pass?

Q.—Are all pupæ capable of moving about and taking food?

Q.—Name the examples given of those which are capable of moving, etc.?

Q.—Wherein do they differ in appearance or form from the perfect insect?

Q.—Name the examples given of those which are incapable of moving and taking food in the pupa state?

Q.—What was the appearance in the larva state of those insects which are incapable of moving in the pupa state?

Q.—Wherein do the pupæ of Beetles, Bees, Wasps, and many Two-winged Flies differ from the pupæ of the Butterflies and Moths, and also from those of many of the Two-winged Flies, and name the examples given of each?

Q.—What figure represents a conical pupa? Also, what figures represent an angular pupa?

Q.—When the pupa is covered with the old larval skin, what is it termed?

Q.—When the pupa is not covered with the old larval skin, what is it termed?

Q.—What is meant by coarctate and obtected?

NOTE.—For word *pupæ*, page 15, 6th line from bottom; page 16, 5th line from bottom; page 17, 4th and 6th lines from bottom, read *pupæ*.

Fig. 65. a, b, eggs; c, newly hatched larva; d, its foot (*tarsus*); e, the larva after first molt; f, larva after second molt; g, pupa (lines at the sides of

figures showing natural length; figure on right showing beak, or proboscis, magnified).

Fig. 66. a, larva; b, pupa; c, eggs, natural size; d, e, eggs magnified.

Fig. 71. Pupa of a moth with tongue case.

Fig. 72. a, wings; b, b, antennæ; t, trunk, or proboscis (as enclosed inside pupa case).

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## CHAPTER V.

Question—How many states or stages through which insects pass have been described, and name them?

Q.—What term is applied to the casting of the skin by the larva?

Q.—What are the changes from one state of insect life to another termed?

Q.—What is meant by transformation (or metamorphosis)?

Q.—Do Caterpillars molt their skins more than once?

Q.—Describe the transformations of the Archippus Butterfly?

Q.—What figures represent the transformations, and describe them?

Q.—Describe the examples given of Larvæ which spin a cocoon, or enter the earth to pass their transformations?

Q.—Describe such other examples as are given in relation to transformation of insects?

Q.—What is meant by a complete transformation?

Q.—What is meant by an incomplete transformation?

Q.—Describe the transformations of the Lace-winged Fly; May-flies; Blister-beetles, and Two-winged Flies?

Q.—Describe the transformations of Grasshoppers, Plant-bugs, Chinch-bugs, etc.?

Q.—Describe the difference in appearance between the

larvæ which pass through a complete transformation and those which pass through an incomplete transformation ?

Q.—What is said in relation to the transformations of insects on page 22 ?

NOTE.—The pupil should commit to memory all after the sixth line on this page.

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## CHAPTER VI.

Question—Name the fourth state or stage of insect life ?

Answer.—Imago.

Q.—What is meant by Imago ? A.—(See Glossary).

Q.—By what character are the perfect insects generally known ? A.—By having wings.

Q.—Are all insects in the perfect state possessed of wings ? A.—No. Some are destitute of wings.

Q.—What examples can you give ? A.—Plant-lice, and some kinds of Grasshoppers.

Q.—Into how many parts is the body of the perfect insect divided, and name them ? A.—Three. The head, thorax and abdomen.

Q.—What figures represent these divisions ? A.—Figures Nos. 8 and 89.

Fig. 89. Grasshopper divided into five parts, namely : head, prothorax, mesothorax and metathorax (the three divisions of the thorax), and the abdomen.

The technical name of each part of the insect is given to assist the pupil when consulting works in which such terms are used.

Q.—Define the terms head, thorax and abdomen, as used in describing insects ? A.—The head is that part of the insect's body which is foremost in the creature's locomotion ; thorax, (see Glos.) ; abdomen, (see Glos.).

Q.—What terms are used in describing the eyes of insects?

A.—Compound eyes and simple eyes. (*Ocelli*, plural; *ocellus*, sing.)

Q.—What is meant by antennæ and to what portion of the insect's body are they attached? A.—The antennæ are two horn-like appendages attached to the head, and are usually placed in a position near the compound eyes.

Q.—What is meant by compound eyes? A.—(See Glossary).

Q.—What examples are given of the simple eyes (*ocelli*) in illustrations? A.—Figs. 89, 333 and 334.

Q.—State what is thought to be the functions of the antennæ? A.—It is supposed that they are in some manner connected with the sense of hearing.

Q.—What are the divisions of the antennæ termed, and how are they described? A.—Joints, and are designated by numbers.

Q.—Which of the joints are designated as the first and last joints? A.—The joint next the head is the first, or basal joint; and the one at the tip, or apex, is the last joint.

Q.—Name the different forms of the antennæ as given in this chapter (including the forms on pages 137 and 140)?

NOTE.—The pupils should be required to commit to memory the name and description of the various forms of antennæ; also, to draw the figures on the black-board; since a thorough knowledge of the forms, etc., of the antennæ is necessary for the classification of insects.

Q.—Name the parts or sets of organs of the mouth of an insect that masticates its food? A.—The upper lip, lower lip, upper jaws and the lower jaws.

Q.—How are they arranged?

NOTE.—The pupil should draw, on paper or black-board, the arrangement of the mouth parts and draw the figures of each, and also the appendages of the lower lip and lower jaws.

Fig. 103. The ventral or underside of a beetle, giving the technical name of each part. (For the same purpose as in fig. 89.)

Q.—What are the appendages of the lower jaws and lower lip termed ? A.—Palpi (or feelers).

Q.—Name the other parts of the mouth not mentioned above ? A.—Tongue, chin, and a second pair of appendages attached to the lower lip.

Q.—On what figures are shown the mouth parts of insects which masticate their food ? A.—Figs. Nos. 89 and 103.

NOTE.—The pupils should be required to give the common name of each part, as in (fig. 103) *labrum*, upper lip; *mandibles*, upper jaws; *maxillæ*, lower jaws; *labium*, under lip; *mentum*, chin. In referring to the *palpi*, or feelers, appendages of the lower jaws and lower lip, the terminating *pi* is plural, and *pus* singular, as *maxillary palpus* (sing.); *labial palpi* (plural).

Q.—Name the figures which represent the upper jaw of an insect which masticates its food ; also, those which represent the lower jaw, upper lip, and lower lip ? A.—Upper jaw, Nos. 89, 103, 107, 108, 109 and 110. Lower jaw, Nos. 89, 103, 111 and 113. Upper lip, Nos. 89, 103, 104 and 105. Lower lip, Nos. 89, 103 and 106.

Q.—Name the figures that represent the feelers (*palpi*) and other appendages of the lower jaws and lower lip ? A.—Nos. 89, 103, 106 and 111.

NOTE.—The above question may be divided as thought best by the teacher.

Q.—Of what forms are the mouth parts of insects, which obtain their nourishment by suction ? A.—In some insects the mouth parts are formed as an elongated beak, or proboscis, and are fitted for piercing the substance on which they feed ; in Butterflies and Moths it is usually as long as the body, and coiled beneath the head, when not in use.

Q.—What class of sucking insects have their mouth parts fitted for piercing ? A.—Bugs, Horse-flies, etc.

Q.—Name an insect with mouth fitted for lapping ? A.—House-fly.

Q.—Name the insects that have their mouth parts fitted for sucking the nectar of flowers ? A.—Butterflies and Moths.

Q.—What figure represents the beak of a sucking insect ? A.—Fig. No. 114, a.

Q.—What figure represents the proboscis of a Butterfly or Moth ? A.—Fig. No. 115, g.

Q.—What part of the head of an insect is termed the *occiput* ? A.—The posterior, or that portion of the head next to the thorax.

Q.—Name the portions of the head as lettered on Fig. 116 ? A.—Forehead or face, a ; vertex, b ; temples, d, d ; eyes, e, e ; cheeks, f ; clypeus, g ; upper lip, h.

Q.—What is the second division of the body of an insect termed ? A.—The thorax.

Q.—What appendages are attached to the thorax ? A.—The wings and legs.

Q.—What figure represents the thorax divided into sections ; and into how many divisions is it divided ? A.—No. 89. The thorax is divided into three divisions.

Q.—To what section is the fore (or anterior) pair of legs attached ? A.—To the section next to the head (prothorax).

Q.—To what section are the upper pair of wings and the middle pair of legs attached ? A.—To the second section from the head (mesothorax).

Q.—To what section are the hind or under pair of wings and posterior pair of legs attached ? A.—To the third section from the head (metathorax).

### Legs.

Q.—What appendage of an insect does Fig. 117 represent ? A.—Leg.

Q.—Name the divisions into which the leg (Fig. 117) is di-

vided and the letters representing them? A.—Thigh, e; shank, f; foot, h.

Q.—Into how many joints is the foot (Fig. 117) divided? A.—Five joints.

Q.—What is attached at the terminal of the fifth or last joint? A.—Two claws.

### Wing.

Q.—What is the texture of the fore or anterior pair of wings of Beetles? A.—A hard, bony texture.

Q.—What is the line where the wings meet upon the back of the Beetle termed, and by what Fig. represented? A.—Suture. Fig. 118.

Q.—What is the character of the surface of the fore-wings, and by what Figs. are they represented? A.—Some are covered with small humps (*rugose*), some with longitudinal ridges (*striae*), Fig. 119, and they are nearly always covered with small punctures as if pricked by the point of a pin, Fig. 120.

Q.—What are these hard, bony fore-wings termed? A.—Wing-cases, as they are never used in flying.

Q.—What is the texture of the anterior or fore-wings of Grasshoppers, Crickets and some kinds of Bugs? A.—They are more or less of a firm, leathery texture.

Q.—By what prominent character or covering can the wings of Butterflies, and nearly all kinds of Moths, be identified? A.—They are covered with scales of various designs.

Q.—What is the texture of the wings when the scales are rubbed off? A.—They are thin and membranous.

Q.—What is the texture of the wings of Bees, Wasps, House-flies, Dragon-flies, Plant-lice, and similar insects? A.—All the wings are thin and membranous.

Q.—What insects have their posterior wings thin and mem-

braneous ? A.—Those which have the anterior or fore-wings thickened.

Q.—Name some of them ? A.—Beetles, Grasshoppers, Crickets, and some other kinds of Bugs.

Q.—Describe the lines by which the wings of Bees, Wasps, and similar insects are divided ? A.—They are furnished with veins, which are more or less connected by cross veins or nerves.

Q.—When these veins and cross veins form enclosed spaces, what are such spaces termed ? A.—Cells.

Q.—When is a cell said to be closed ? A.—When it is surrounded by veins and cross veins as 2, 2, 2, Fig. 125.

Q.—When is a cell said to be open ? A.—When the posterior margin of the wing forms one of its sides as 4, 4, Fig. 125.

Q.—By what characteristics do Naturalists determine the genera and species of Plant-lice (*Aphis*) ? A.—By the difference in the veining of the wings.

Q.—What do Figs. 126, 127, and 128, represent ? A.—The wings of the Rose and Grain *Aphis*, Apple-tree *Aphis* and the Woolly *Aphis*.

Q.—What is the third or posterior division of the body of an insect termed ? A.—The abdomen.

Q.—What are the functions of this division ? A.—It contains the organs of nutrition and of reproduction, and the spiracles through which it breathes. It is sometimes furnished with a sting as in Bees and Wasps, or with an ovipositor as in Saw-flies, *Ichneumon*-flies, etc.

Q.—On what figure of a perfect insect are the spiracles represented ? A.—Fig. 89.

Q.—What figures represent the wings of a Moth ; Butterfly ; Two-winged Fly ; Bee ; Wasp or Saw-fly, and also of the Plant-lice (*or Aphis*) ? A.—Nos. 121, 122, Moths ; No. 123,

Butterfly ; No. 124, Two-winged Fly ; No. 125, Bee, Wasp, but particularly the Saw-fly.

Q.—What figure represents the ovipositor of the Saw-fly, also of the Ichneumon-fly ? A.—No. 129, ovipositor of the Saw-fly ; No. 131, ovipositor of the Ichneumon-fly, both highly magnified.

NOTE.—The last two questions may be divided.

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## CHAPTER VII.

The pupils should study this chapter carefully, the teacher asking such questions as will assist them in understanding the text.

*True insects* are those which are furnished with six legs. (See Chap. 1, page 2.)

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## CHAPTER VIII.

Question—Into how many Orders are *true insects* divided ?  
Answer.—Seven.

Q.—By what characters are the Orders named in this chapter determined ? A.—By the number and structure of the wings.

Q.—Name the seven Orders, giving the technical and common names, also the typical insects ? A.—The pupil should be required to memorize all of page 36, and also the first two lines on page 37.

NOTE.—The division of insects into seven orders, as given in this chapter, refers only to the *true insects*. I have followed the arrangement of orders by Dr. A. S. Packard, Jr., excepting I have omitted his eighth order, *Thysanura*, which comprise the *bristle-tails* and *spring-tails*.

## CHAPTER IX.

Question—Into how many sections are the Orders of true insects divided, as characterized by the difference in the mouth parts ? Answer—Two.

Q.—Name those comprising the first section? A.—Gnawing insects, or those that are furnished with jaws (for masticating their food).

Q.—What Orders belong to this section? A.—Hymenoptera, (or membranous-winged); Coleoptera, (or sheath-winged); Orthoptera, (or straight-winged); and Neuroptera, (or nerved-winged).

Q.—Name those comprising the second section? A.—Sucking insects, or those that have the mouth parts formed into a beak or proboscis.

Q.—What Orders belong to this section? A.—Lepidoptera, (or scaly-winged); Hemiptera, (or half-winged,) (divided in Sub-orders as in Chap. 8), and Diptera (two-winged).

## SECTION I.

Q.—Name the four Orders which comprise the first section, or gnawing insects? A.—Hymenoptera, Coleoptera, Orthoptera and Neuroptera.

Q.—Name some insects belonging to the Hymenoptera? A.—Bees, Wasps, Saw-flies, and Ichneumon-flies.

Q.—How many wings have the insects of this Order ? A.—Four (excepting a few species which are wingless).

Q.—What characterizes the wings as to size? A.—The hind or posterior pair is the smaller.

Q.—Describe the mouth parts of Bees, Wasps, etc. ? A.—The upper jaws are fitted for biting ; the lower jaws are fitted for sucking or lapping their food.

Q.—Name an insect of this Order, the female of which is armed with a piercer, or saw, which she uses to puncture the leaves or twigs of plants to deposit her egg? A.—The Saw-fly.

Q.—Name an insect of this Order, the female of which deposits her egg in the bodies or eggs of other insects? A.—Ichneumon-fly.

Q.—How do the young (larvæ) of the insects of this Order procure their food? A.—Many are provided with food stored by their parents. The larvæ of the Saw-flies live upon the leaves of plants.

Q.—Are the larvæ provided with legs? A.—The larvæ of the Saw-flies have twenty or twenty-two legs, but the larvæ of a greater number of insects of this order are destitute of legs.

Q.—Are their transformations complete or incomplete? A.—Complete.

Q.—Describe the pupa of the Strawberry Saw-fly? A.—The legs, antennæ, and wings are enclosed in separate cases.

Q.—When do the larvæ of this Order of insects pupate? A.—The larvæ usually pupate, etc., (see text).

Q.—Name the illustrations which have been given of typical insects of this Order in this and preceding chapter? A.—Fig. 1, Wasp; Figs. 15, 130, 133 and 137, Saw-flies; Figs. 131 and 134, Ichneumon-flies.

### Coleoptera.

Q.—Name some of the insects which belong to the Order of Coleoptera? A.—Melœ, Darkling Beetles, the Beetle which produced the Flat-headed Apple-tree Borer, June Beetle, and the Striped Cucumber Beetle.

Q.—How many wings have Beetles? A.—They are provided with four wings (excepting a few species).

Q.—By what terms are the fore-wings of Beetles known ?  
A.—Wing cases ; *elytra*.

Q.—Do the fore-wings of Beetles meet in a straight line (*suture*) in all species ? A.—No. The fore-wings of Melœ overlap each other, and the wing-cases of some of the Darkling Beetles are united at the *suture*.

Q.—Are the hind wings of Beetles of a hard and horny texture, similar to the fore wings ? A.—No, they are membranous.

Q.—How are they folded when the insect is at rest ?  
A.—They are folded lengthwise and crosswise, and concealed beneath the fore wings.

Q.—Are their transformations complete or incomplete ?  
A.—Complete.

Q.—Are the larvæ of Beetles termed Caterpillars ? A.—No ; they are commonly termed grubs.

Q.—How many legs have the grubs of Beetles ? A.—The grubs of some beetles have six legs, but a great many kinds are entirely destitute of legs.

Q.—Have the grubs of Beetles a distinct head ? A.—Yes.

Q.—Where do the larvæ prepare to enter the pupa state ?  
A.—Some in the substance in which they live ; others enter the earth and spin a slight cocoon.

Q.—Are the appendages of the body folded on the breast, as in Fig. 67, or are they in separate cases, as in Fig. 68 ?  
A.—They are encased in separate cases, as in Fig. 68.

Q.—Name the illustrations of typical insects of this order which have been given in this and preceding chapters ?  
A.—Fig. 4, the Goldsmith Beetle ; Figs. 19, 86 and 120, Potato Beetles ; Fig. 118, Tortoise Beetle ; Fig. 119, Darkling Beetle ; Fig. 138, beetle which produces the grub commonly known as the Flat-headed Apple-tree Borer, and Fig. 139, the June Beetle.

## Orthoptera.

Q.—Name some typical insects of the Order Orthoptera ?

A.—Grasshoppers, Crickets, Katydids and Earwigs.

Q.—How many wings have Grasshoppers, Crickets, etc.?

A.—Four wings.

Q.—Describe the texture, folding, etc., of the wings ?

A.—The fore-wings are thickened or parchment-like, and overlap each other on the back. The hind wings are thinner, and when at rest are folded up lengthwise like a fan, and are nearly concealed beneath the anterior pair.

Q.—Are all the insects of this Order provided with wings ?

A.—No ; in a few species one or both pairs are wanting.

Q.—Are the transformations of the insects of this Order complete ? A.—No ; they are incomplete.

Q.—Are the insects belonging to the Order Orthoptera injurious ? A.—All are more or less injurious excepting the Mantis family.

Q.—What similarity of characters are there between the Earwigs of this Order and the Rove Beetles of the Order Coleoptera ? A.—The fore-wings of each meet in a straight line on the back.

Q.—How are they distinguished from each other ? A.—By the prominent anal forceps with which the Earwigs are provided. (See Fig. 41, c.)

Q.—Name the illustrations which have been given of typical insects of this Order in this and preceding chapters ? A.—Fig. 21, Jumping Tree-cricket ; Fig. 41, a, the Earwig ; Fig. 141, the Katydid, and Fig. 142, the Praying Mantis.

## Neuroptera.

Q.—Name some insects belonging to the Order Neuroptera ?

A.—Dragon Flies, May Flies, White Ants and Lace-winged Flies.

Q.—How many wings have Dragon Flies, May Flies, etc.?

A.—Four; but in some species the hind wings are wanting and several other species are entirely wingless.

Q.—Name a prominent character in the structure of their wings? A.—They appear like a net work of veins.

Q.—Are the bodies and appendages of Neuroptera of a hard and horny texture? A.—No; they are soft.

Q.—What are the habits of the larvæ? A.—They are mostly aquatic.

Q.—Are their transformations complete or incomplete?

A.—Some are incomplete, having active pupæ; others are complete.

Q.—Name an insect belonging to this Order that is injurious? A.—The White Ant.

Q.—Name a species that is eminently beneficial? A.—The Lace-winged Fly.

Q.—Are the Neuroptera beneficial or injurious? A.—Beneficial, generally; the White Ants being the exception.

Q.—Name the illustrations which have been given of typical insects of this Order in this and preceding chapters? A.—Fig. 22, Lace-winged Fly, and Fig. 143, Dragon Fly.

Q.—How many legs have the larvæ of Neuroptera? A.—Six.

## SECTION II.

Q.—Name the three Orders which comprise the second section of Sucking Insects? A.—Lepidoptera, Hemiptera and Diptera.

### Lepidoptera.

Q.—Name the typical insects of Lepidoptera? A.—Butterflies and Moths.

Q.—How many wings have Butterflies and Moths? A.—Four.

Q.—Are there any exceptions in regard to the number of wings ? A.—Yes ; the females of the Canker-worm Moths are wingless.

Q.—What are the prominent characters in the wings of Lepidoptera for classification ? A.—They are covered with minute scales.

Q.—Describe the mouth parts of the Lepidoptera ? A.—The upper lip and jaws are rudimentary, while the lower jaw is formed into a long tube or proboscis fitted for sucking.

Q.—Are their transformations complete or incomplete ? A.—Complete.

Q.—In the pupa state are the appendages enclosed in separate cases ? A.—No ; they are enclosed in a common sheath or covering.

Q.—How many legs have the larvæ of Lepidoptera ? A.—From ten to sixteen legs.

Q.—What example is given of a larva provided with ten legs ? A.—The Spring Canker-worm, Fig. 150.

Q.—What example is given of larvæ provided with sixteen legs ? A.—The larva of the Achemon Sphinx, Fig. 152.

Q.—Are the larvæ of Lepidoptera injurious ? A.—They are all injurious excepting one small species.

Q.—Name the illustrations which have been given of typical insects of this Order in this and preceding chapters ? A.—Figs. 16, 81, 88 and 146, Butterflies ; Figs. 17, 147 and 148, Moths.

### Hemiptera.

Q.—What are the insects of the Order Hemiptera commonly termed ? A.—True Bugs.

Q.—Name some insects which belong to Hemiptera ? A.—The Dotted-legged Plant Bug, the Spined Soldier Bug, the Ring-banded Soldier Bug, and the Many-banded Robber.

Q.—How many wings have True Bugs ? A.—They are usually provided with four wings, but some are entirely destitute of wings.

Q.—What terms are applied to the mouth part of the True Bugs ? A.—Beak or proboscis.

Q.—In how many Sub-orders is the Order of Hemiptera divided, and name them ? A.—Two ; Homoptera and Heteroptera.

### Homoptera.

Q.—Name some typical insects of the Sub-order *Homoptera* ? A.—The Buffalo Tree-hopper, Vine Hoppers, Grain Aphid, Hop Aphid, Apple-tree Aphid and the Scale Insects.

Q.—Describe the wings of the Homoptera ? A.—They have the wings of the same texture throughout, either wholly leathery or wholly membranous.

Q.—What examples can be given ? A.—The Buffalo Tree-hopper representing the former, and the Grain Aphid representing the other.

Q.—Is the beak attached to the front of the head of insects of this Sub-order ? A.—No ; it is attached to the posterior part of the under side of the head, and sometimes apparently arises from the breast.

Q.—Are the insects of this Sub-order beneficial or injurious ? A.—They are all injurious to vegetation.

Q.—Name some of the wingless forms ? A.—Some of the Aphid and the females of the Scale Insects.

Q.—Name the illustrations which have been given of typical insects of this Sub-order in this and preceding chapters ? A.—Figs. 24, 156, 157 and 158, Plant-lice ; Fig. 155, Buffalo Tree-hopper ; Fig. 159, Red Scale insect.

## Heteroptera.

Q.—Name some insects belonging to the Sub-order Heteroptera? A.—Plant Bugs, Soldier Bugs, Harlequin Cabbage Bugs, Thrips, Large Belostoma and Squash Bugs.

Q.—How many wings have the insects of this Sub-order (see Hemiptera)? A.—They have usually four, but some are wingless.

Q.—Describe the fore-wings of the Heteroptera? A.—The fore-wings are thickened at the base, while the outer part is thin and more membranous.

Q.—Is the beak attached to the breast or posterior portion of the head, as in Homoptera? A.—No; the beak issues from the fore part of the under side of the head.

Q.—Are the insects of this Sub-order injurious to vegetation, or are they beneficial? A.—Some are predaceous, others parasites, and others feed upon the juices of plants.

Q.—When at rest are the wings held slanting over the back like a steep roof, as in Homoptera? A.—No; they lie flatly on the back and overlap each other.

Q.—Name the illustrations which have been given of typical insects of this Sub-order in this and preceding chapters? A.—Fig. 20, Plant Bug; Fig. 85, Chinch Bug; Fig. 114, True Bug (the Spined Soldier Bug); Fig. 153, Ring-banded Soldier Bug; Fig. 154, Many-banded Soldier Bug; Fig. 160, Cabbage Bug; Fig. 161, Thrip; Fig. 162, Belostoma (Water Bug); and 163, the Squash Bug.

## Diptera.

Q.—Name some of the insects belonging to the Order Diptera? A.—The Wheat Midge, Onion Fly and Crane Fly.

Q.—How many wings have insects belonging to the order Diptera? A.—Two.

Q.—By what are the posterior wings represented, and by what name are they known? A.—By a pair of thread-like organs, knobbed at the outer end. These appendages are called balancers, or halteres.

Q.—Name the illustrations in this and preceding chapters in which the balancers, or halteres, are shown? A.—Figs. 8, 18, 124, 164, 165 and 168?

Q.—In Diptera, are the transformations complete or incomplete? A.—Complete.

Q.—Are the mouth parts adapted for gnawing? A.—No; they are fitted for piercing or lapping.

Q.—What are the larvæ of Diptera commonly termed? A.—Maggots.

Q.—Name the illustrations which have been given of typical insects of this Order, in this and preceding chapters? A.—Figs. 8 and 168, Crane Flies; Fig. 18, Hessian Fly; Fig. 23, Flesh Fly; Fig. 124, Olive Fly; Fig. 164, Wheat Midge; and Fig. 165, the Onion Fly.

## CHAPTER X.

(Reference may be made to Chapter III for some of the answers).

Question—Name the illustrations given in this and preceding chapters of the larvæ that closely resemble the parent when they first issue from the egg? Answer—Fig. 41a, larva of Earwig, Order Orthoptera; Fig. 42, larva of Thrip; Fig. 43b, larva of Soldier Bug (Spined); Fig. 65c, larva of Chinch Bug; Fig. 66a, larva of Harlequin Cabbage Bug; Order Hemiptera.

Q.—In what other Order than Orthoptera and Hemiptera

do the larvæ resemble the parent insect ? A.—In some species of the Order Nueroptera.

Q.—Wherein do the larvæ of Orthoptera and Hemiptera differ ? A.—The larvæ of the Orthoptera are provided with jaws, capable of masticating their food ; the larvæ of the Hemiptera are provided with a beak, fitted only for sucking the sap of trees, etc.

Q.—Wherein do the larvæ of the Orthoptera and such larvæ of the Neuroptera as resemble the parent insect, differ ? A.—The larvæ of the Neuroptera are aquatic, excepting those of the Lace-winged Flies and Ant Lions ; while those of the Orthoptera are terrestrial.

Q.—Wherein do the larvæ that resemble the perfect insects differ from the Imago ? A.—In being destitute of wings.

#### Larvæ Destitute of Legs.

Q.—Name the illustrations given in this and preceding chapters of larvæ that are destitute of legs, and having a distinct head ? A.—Fig. 53, larva or grub of the Plum Curculio ; Fig. 54, larva of the Flat-headed Apple-tree Borer ; and Fig. 55, the larva or grub of the Round-headed Apple-tree Borer.

Q.—Name the illustrations given in this and preceding chapters of larvæ that are destitute of legs and without a distinct head ? A.—Fig. 23a, larva of the Flesh-fly ; Fig. 56, larva of the Hessian Fly ; Fig. 63, larva of the Syrphus Fly ; Fig. 64, larva of the House-fly ; Fig. 167, larva of the Helophilus Fly ; Fig. 170, larva of the Ox Bot-fly.

Q.—When the larva is apparently headless, and is destitute of legs, what is it commonly termed ? A.—A Maggot (see page 14).

Q.—When the larva is destitute of legs, and provided with a distinct head, what is it commonly termed ? A.—A grub (see page 11).

Q.—What other larvæ are commonly called grubs?  
A.—Those which are worm-like, and provided with six legs.

Q.—To what Order do the insects belong which, in the second state of their existence, are called Maggots? A.—Two-winged Flies (Diptera).

Q.—To what Orders do the insects belong which, in the second state of their existence, are destitute of legs and are provided with a head? A.—To the Hymenoptera and Coleoptera.

Q.—How can the grubs or larvæ of Coleoptera and Hymenoptera be distinguished from each other? A.—If the grubs are found in nests, stored with dead insects or with pollen, or in the eggs or bodies of insects, or in larva, or in a gall on the leaf, stem, or twig of a plant, they belong to Hymenoptera; otherwise they may belong to the Coleoptera.

Q.—To what Order do the insects belong that, in the second state of their existence, are worm-like and provided with six legs? A.—Coleoptera; excepting a few species that belong to Neuroptera, and are not aquatic.

Q.—Name the illustrations given in this and preceding chapters of the worm-like larvæ, or grubs, that are provided with six legs? A.—Fig. 46, Wire-worm; Fig. 57, grub of a Ground Beetle; Figs. 139-2, grub of the June Beetle; Fig. 140, grub of the Cucumber Beetle; Fig. 169, grub of the Prionus Beetle; Fig. 171, grub of the Asparagus Beetle; and Fig. 172, grub of the Rose Beetle, Order Coleoptera; and Fig. 47, grub of the Lace-winged Fly, Order Neuroptera.

Q.—By what character can the grubs of Neuroptera and those of Coleoptera be distinguished? A.—Such grubs of the Neuroptera as are terrestrial are provided with long, prominent jaws, which project horizontally from the head, thus differing from the Coleoptera.

## Caterpillars.

Q.—Name the illustrations given in this and preceding chapters of worm-like larvæ, which are provided with not less than ten nor more than sixteen legs? A.—Figs. 78, 87 and 173 are the larvæ of Butterflies; Fig. 50, larva of the Tussock Moth; Fig. 52, larva of the Glassy Cut-worm; Figs. 58, 61 and 62, larvæ of the Geometer Moths; Fig. 150a, larva of the Spring Canker-worm; Fig. 151f, larva of Fall Canker-worm; and Fig. 152, larva of Achemon Sphinx.

Q.—Name the illustrations given in this and preceding chapters of worm-like larvæ, that are provided with more than sixteen legs? A.—Fig. 44a, larva of the Native Currant Saw-fly; Fig. 60a, larva of the Imported Currant Saw-fly; Fig. 136, larva of the Rose Saw-fly; Fig. 137-4, larva of the Strawberry Saw-fly; and Fig. 174a, larva of the Pear Slug.

Q.—What is meant by the term True Caterpillars? A.—Caterpillars, or larvæ, having not less than ten nor more than sixteen legs.

Q.—What are Caterpillars having more than sixteen legs termed? A.—False Caterpillars.

Q.—To what Order do the insects belong which, in the second state of their existence, are provided with from ten to sixteen legs? A.—Lepidoptera.

Q.—To what Order do the insects belong that, in their second state of existence, are provided with more than sixteen legs? A.—Hymenoptera.

Q.—Supposing you dig from the ground a larva without any visible head, and destitute of legs, to what Order of insects would it belong? A.—Diptera.

Q.—Supposing you were chopping down a tree, and in the wood found a larva destitute of legs, to what Order of insects would it belong? A.—Coleoptera.

Q.—Supposing that you found an insect's nest, and on examination it contained a larva destitute of legs, and the bodies of insects apparently dead, to what Order of insects would it belong? A.—Hymenoptera.

Q.—Supposing you found a Caterpillar provided with twenty legs, to what Order of insects would it belong? A.—Hymenoptera.

Q.—Supposing that you found a Caterpillar provided with ten, twelve, or sixteen legs, to what Order of insects would it belong? A.—Lepidoptera.

Q.—Supposing that you found a worm-like larva provided with six legs, and furnished with short, stout jaws for masticating its food, to what Order of insects would it belong? A.—Coleoptera.

Q.—Supposing that a worm-like insect was provided with long, prominent jaws, which projected horizontally in front of the head, and was also furnished with six legs, to what Order of insects would it belong? A.—If terrestrial, it would belong probably to Neuroptera.

Q.—What are the mouth parts of the larvæ of Hemiptera termed? A.—A beak or proboscis.

Q.—Name the illustrations by which the beak or proboscis of the Hemiptera are shown? A.—Figs. 20, 114a, 153c, and 157-2.

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## CHAPTER XI.

### Classification of Insects into Orders.

Question—Name the divisions into which insects are classified?

Q.—Describe how a genus is formed?

Q.—Describe how a family is formed ?

Q.—Describe how an Order is formed ?

Q.—What is a general rule in relation to the families of insects ?

Q.—If, on examination, an insect is found to have mouth-parts capable of masticating food, and fore-wings of a hard, horny texture, and the under or hind wings membranous, to what Order does it belong ? A.—Coleoptera, or sheath-winged.

Q.—Supposing that the fore-wings are parchment-like or leathery, and the hind or under wings membranous and folded lengthwise like a fan, to what Order does it belong ?

A.—Orthoptera or straight-winged.

Q.—Suppose an insect is provided with four membranous wings, furnished with biting jaws, and the abdomen is armed with a piercer or sting, to what Order does it belong ? A.—Hymenoptera, or membrane-winged.

Q.—If an insect is provided with four membranous wings of equal size and not alike in structure, and is furnished with biting jaws, and the abdomen is not armed with a sting or piercer, to what Order does it belong ? A.—Neuroptera, nerve-winged.

Q.—An insect is presented for examination. It is provided with four wings covered with scales and the mouth parts fitted for sucking, to what Order does it belong ? A.—Lepidoptera, or scaly-winged.

Q.—Describe an insect belonging to the Order Hemiptera ? A.—An insect provided with four wings which lie flat upon its back and overlap each other ; the mouth parts formed for sucking and in the form of a beak ; belongs to the Order Hemiptera and Sub-order Heteroptera.

Q.—Describe an insect that belongs to the Sub-order Homoptera ?

Q.—Describe an insect that belongs to Diptera ?

Q.—In what Order are Fleas classed ?

Q.—Why are Bed-bugs placed in the Order Hemiptera ?

Q.—Why are Head and Body-lice placed in the Order Hemiptera ?

Q.—In what Order are the Chicken-lice placed ?

Q.—By what characters are wingless insects classified ?

A.—By the structure of the mouth parts.

NOTE.—The pupil should be required to memorize the remainder of this Chapter, beginning with words : "The names of the different Orders end in *ptera*," etc.

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## CHAPTER XII.

### Classification of Insects into Families.

#### Hymenoptera.

Q.—Name the families of the Order Hymenoptera ?

A.—Bees, Wasps, Sand Wasps or Wood Wasps, Digger Wasps, Ants, Golden Wasps, Ichneumon Flies, Egg Parasites, Brasslets or Chalcid Flies, Gall Flies, Saw-flies, and Horn Tails.

#### Bees.

Q.—Describe the characters by which Bees are distinguished from other insects of the Order Hymenoptera ?

Q.—Where do Bees construct their nests ?

Q.—What material is used by some kinds of Bees for lining their nests ?

Q.—What species of this family live parasitically in the nests of those Bees that gather pollen ?

Q.—What is said of the larvæ of this family ?

### Wasps.

Q.—Describe the characters by which Wasps are identified?  
 Q.—Of what material do Wasps build their nests?  
 Q.—With what kind of food do they store their nests for their young to live upon?

### Sand Wasps or Wood Wasps.

Q.—Describe the characters by which Sand Wasps or Wood Wasps are distinguished?  
 Q.—Where do they build their nests?  
 Q.—What is said about their larvæ?

### Digger Wasps.

Q.—Describe the characters by which Digger Wasps are distinguished?  
 Q.—Where do they build their nests?  
 Q.—Are they injurious to vegetation?

### Ants.

Q.—What is the general form of the antennæ of Ants?  
 Q.—What is said of their larvæ?  
 Q.—Are all Ants winged?

### Golden Wasps.

Q.—Describe the characters by which the Golden Wasps are distinguished?  
 Q.—What is said of their larvæ?

### Ichnuemon Flies.

Q.—Describe the characters by which the Ichnuemon Flies are distinguished?

Q.—Are the Ichnuemon Flies classed among injurious insects? A.—No; on the contrary, they are among the most beneficial insects known.

Q.—On what class of insect life are they parasitic? A.—They live within the bodies of Caterpillars and other injurious larvæ.

Q.—What example is given? A.—A Bracon Fly, which is parasitic on DeLong's Moth.

Q.—What is said of their larvæ?

Q.—Name the illustrations of Ichneumon Flies in the preceding chapters? A.—Figs. 131 and 134.

### Egg Parasites.

Q.—Describe the characters by which the Egg Parasites are distinguished?

Q.—On what do they live or feed upon while in the larvæ or second state of their existence?

Q.—What is the length of the perfect insect?

### Brasslets or Chalcid Flies.

Q.—Describe the characters by which the Brasslets or Chalcid Flies are distinguished?

Q.—Describe their larvæ and their habits?

### Gall Flies.

Q.—Describe the characters by which the Gall Flies are distinguished?

Q.—Describe the habits of their larvæ?

### Saw Flies.

Q.—Describe the characters by which the Saw-flies are distinguished?

Q.—How many legs have the larvæ of Saw-flies?

Q.—Upon what do they feed?

Q.—Name the illustrations of the larvæ of Saw-flies given in the preceding chapters? A.—Nos. 40, 60, 136, 137 and 174. (The answer from pupil should contain the name of each.)

Q.—Name the illustrations of the perfect Saw-flies given in the preceding chapters? A.—Nos. 15, 130, 133, 137 and 139.

### Horn Tails.

Q.—Describe the characters by which Horn Tails are distinguished?

Q.—With how many legs are the larvæ of Horn Tails provided?

Q.—In what material do the larvæ live?

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## CHAPTER XIII.

### Classification of Insects into Families—Continued.

#### Lepidoptera.

Question—Into how many sections are the insects of this Order divided, and name them? Answer—Two sections, Butterflies and Moths.

#### SECTION I.

Q.—What are the prominent antennal characters by which Butterflies can be distinguished? A.—The antennæ are filiform and terminate in a knob or club.

Q.—What examples of the antennæ of Butterflies are given in the illustrations? A.—Figs. 18, 81, 88, 95, 123, 146, 175 and 190.

Q.—Do Butterflies fly at night?

Q.—Describe the appearance of the perfect insect, and the position in which the wings are held when at rest?

Q.—Describe the appearance and habits of Caterpillars (*larvæ*) of Butterflies, and their habits when about to assume the pupa state?

## SECTION II.

Q.—What are the prominent antennal characters by which Moths can be distinguished from Butterflies ? A.—The antennæ never terminate in a knob or club, although it is frequently thickened toward the tips.

Q.—What examples of Moths are given in the preceding illustrations ? A.—Figs. 17, 93, 94, 97, 115, 147, 148 and 178.

NOTE.—When the antennæ are comb-toothed, as in Fig. 115, they are termed *pectinate*; and when comb-toothed on both sides, as in Fig. 204, they are termed *bi-pectinate*.

Q.—Name the different forms of antennæ of Moths ? A.—Figs. 17 and 94, bristle-like; 93 and 178, spindle-shaped; 97, saw-toothed; 115 and 147, comb-toothed; 148, thread-like.

NOTE.—See bristled antennæ, Fig. 343, and fringed antennæ, Fig. 345.

Q.—Do Moths usually fly in the daytime ?

Q.—Describe the appearance of the perfect insect, and the position in which the wings are when at rest ?

Q.—Describe the habits of the Caterpillars of Moths when they are about to change into the pupa state ?

Q.—Into how many Families are Butterflies divided, and name them ? A.—Five. Swallow Tails; White and Yellow; Four-footed; Thecla and Copper, and Skippers.

Q.—Into how many Families are the Moths divided, and name them ? A.—Nine. Hawk Moths; Clear-winged Moths; Wood Nymphs; Spinners; Owlet Moths; Geometrid Moths; Snout Moths; Leaf-rollers; Leaf-miners, and Plume Moths.

NOTE.—The names of families of all the Orders of insects should be memorized by the pupil.

The questions to be given, relating to the characters, etc., by which the Families of the First Section of Lepidoptera

(Butterflies) can be distinguished from each other, may be arranged as follows :

Q.—Describe the characters by which the (giving the name of the Family) Butterflies are distinguished ?

NOTE.—This question should be answered by the pupil describing the prominent characters, etc.

The following questions may then be given, or such of them as may be indicated by the numbers :

1.—What are the colors of the (giving the name of the Family) Butterflies ?

2.—What tibial character is prominent ?

3.—By what tarsal character are they distinguished ?

4.—By what character pertaining to the form, etc., of the hind (or under) wings are the (giving the name of the Family) Butterflies distinguished ?

5.—Name the example (or examples) given in the illustrations of the (giving the name of the Family) Butterflies ?

6.—Describe the appearance and habits of the Caterpillars (larvæ) of the —— Butterflies ?

7.—Describe the habits of the Caterpillar when preparing to enter the pupa state ?

8.—Name the example (or examples) given of the Caterpillars of the —— Butterflies in the illustrations ?

9.—Name the example given of the pupa of the —— Butterflies ?

NOTE.—When the question, Describe the characters by which the —— Butterflies are distinguished ? is followed by the numbers 1, 2, 3, 4, 5, 6, 7, 8 and 9, or any of these numbers, they indicate that the question to which these numbers are attached should be given the pupil or pupils, so that in preparing the answers they may fully understand the characters by which Butterflies are classified.

The same course will be followed in the Second Section of Lepidoptera (Moths), excepting that some of the questions will be changed.

FIRST SECTION. (*Lepidoptera.*)

## Butterflies.—Swallow Tails.

Q.—Describe the characters by which the Swallow Tails are distinguished ?

Q.—Nos. 1, 2, 4, 5, 6, 7 and 8.

NOTE.—Ans. to Question 5: Figs. 16 and 190.

## White and Yellow Butterflies.

Q.—Describe the characters by which the White and Yellow Butterflies are distinguished ?

Q.—Nos. 1, 2, 4, 5, 6, 7, 8 and 9.

NOTE.—Ans. to Ques. 5 : Figs. 175, 176 and 191 ; Ans. to Ques. 8 : Figs. 87, a, and 192, a ; Ans. to Ques. 9 : Figs. 87, b, and 192, b.

## Four-footed Butterflies.

Q.—Describe the characters by which the Four-footed Butterflies are distinguished ?

Q.—Nos. 1, 3, 4, 5, 6, 7 and 8.

NOTE.—Ans. to Ques. 5 : Figs. 81, 146 and 193 ; Ans. to Ques. 8 : Figs. 78 and 193, b.

## Thecla and Copper Butterflies.

Q.—Describe the characters by which the Thecla and Copper Butterflies are distinguished ?

Q.—Nos. 1, 2, 3, 6 and 7.

## Skipper Butterflies.

Q.—Describe the characters by which the Skipper Butterflies are distinguished ?

Q.—Nos. 1, 2, 3, 4, 6 and 7.

NOTE.—Spurs are stiff bristles or spines on the shank (or *tibia*) of the leg of an insect, as at apex of shank, Fig. 117. When as at f, Fig. 117, it is said the shank is spinous or spined. The spurs represented at apex of tibia in Figs. 1 and 103 are good examples. In descriptions of Lepidoptera, the term legs armed means provided with spines.

SECOND SECTION. (*Lepidoptera.*)

## Moths.

The questions to be given, relating to the characters, etc., by which the Families of the Second Section of Lepidoptera (Moths) can be distinguished from each other, may be arranged as follows :

Q.—Describe the characters by which the —— Moths are distinguished ?

1.—Describe the form of the body of the —— Moths ?

2.—Describe the wings of the —— Moths ?

3.—Describe the head and palpi of the —— Moths ?

4.—With which form of antennæ are the —— Moths provided ?

5.—Have the —— Moths the thorax or tip of abdomen tufted ?

6.—Name the example (or examples) given of the —— Moths in the illustrations ?

7.—Describe the appearance and habits of the Caterpillars of the —— Moths ?

8.—Describe the habits of the Caterpillars when preparing to enter the pupa state ?

9.—Name the example (or examples) given of the Caterpillars of the —— Moths in the illustrations ?

10.—Name the examples given of the pupæ of the —— Moths in the illustrations ?

11.—How many legs are the Caterpillars of the —— Moths provided with ?

## Hawk Moths.

Q.—Describe the characters by which the Hawk Moths are distinguished ?

Q.—Nos. 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11.

NOTE.—To Ans. 6 add Fig. 178 ; Ans. to Ques. 10 : Figs. 71 and 149. Antennæ spindle-shaped. Larvæ injurious to grape-vines, etc.

**Clear-winged Moths.**

**Q.**—Describe the characters by which the Clear-winged Moths are distinguished?

**Q.**—Nos. 1, 2, 5, 6, 7, 8, 9 and 11.

**NOTE.**—The antennæ of these Moths increase in size from the base nearly to the tip; pectinate in the males. Larvæ injurious to the peach-tree, raspberry and currant-bushes, etc., as borers.

**Wood Nymphs.**

**Q.**—Describe the characters by which the Wood Nymph Moths are distinguished?

**Q.**—Nos. 2, 3, 5, 6, 7, 8, 9, 10 and 11.

**NOTE.**—Ans. to Ques. 10: Fig. 202, a, and Fig. 203, a; Ans. to Ques. 11: Fig. 203, b. The antennæ is either simple or pectinate, sometimes larger in the middle than at either end. Larvæ injurious to the foliage of the grape-vine.

**Spinners.**

**Q.**—Describe the characters by which the Spinners are distinguished?

**Q.**—Nos. 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11.

**NOTE.**—Figs. 207 and 208; a, larva; b, pupa. Larvæ injurious to vegetation (excepting the Silk-worm).

**Owlet Moths.**

**Q.**—Describe the characters by which the Owlet Moths are distinguished?

**Q.**—Nos. 3, 4, 5, 6, 7, 9, 10 and 11.

**NOTE.**—Fig. 209, a and b, egg; c, larva; d, pupa. Fig. 211, a, larva; b, pupa. Larvæ injurious to foliage, and of the larvæ a few species enter the stems of plants.

**Geometrid Moths.**

**Q.**—Describe the characters by which the Geometrid Moths are distinguished?

**Q.**—Nos. 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11.

NOTE.—Fig. 213, a, larva; c, pupa. Fig. 215, b, wingless female; c, three joints of antennæ, enlarged. Fig. 216, b, wingless female; c, a portion of antennæ enlarged. Larvæ injurious to the foliage of fruit trees, etc.

### Snout Moths.

Q.—Describe the characters by which the Snout Moths are distinguished?

Q.—Nos. 1, 3, 4, 6, 7, 8, 9, 10 and 11.

NOTE.—Fig. 217, 1, larva in tube; 2, larva, enlarged; 3, pupa. Fig. 218, 1, 2, 3, larvæ; 4, pupa; 7, tube. Larvæ injurious to the foliage of the grape-vine, etc.

### Leaf-rollers.

Q.—Describe the characters by which the Leaf-rollers are distinguished?

Q.—Nos. 1, 2, 3, 4, 6, 7, 9, 10 and 11.

NOTE.—Fig. 250, a, larva; b, larva, enlarged. Fig. 223, a, nest; b, pupa; c and e, larvæ. Larvæ injurious, especially the larva of the Codlin Moth.

### Leaf-miners.

Q.—Describe the characters by which the Leaf-miners are distinguished?

Q.—Nos. 1, 2, 3, 4, 6, 7 and 11.

NOTE.—Larvæ injurious.

### Plume Moths.

Q.—Describe the characters by which the Plume Moths are distinguished?

Q.—Nos. 1, 2, 6, 7, 8, 9, 10 and 11.

NOTE.—Fig. 227, a, larva; b, pupa. Larvæ injurious to the foliage of grape-vine.

## CHAPTER XIV.

## Diptera.

Question.—Into how many sections are the insects of this Order divided, and name them? Answer.—Two ; Long-horned Flies and Short-horned Flies.

Q.—What are the prominent antennal characters by which the Long-horned Flies can be distinguished? A.—They are composed of four or more joints.

Q.—What are the prominent antennal characters by which the Short-horned Flies can be distinguished? A.—The antennæ are short and are two or three jointed.

## Long-horned Flies.

Q.—Into how many Families are the Long-horned Flies divided, and name them? A.—Four ; Mosquitoes, Gall Gnats, Crane Flies and Fleas.

## Short-horned Flies.

Q.—Into how many Families are the Short-horned Flies divided, and name them? A.—Four ; Horse Flies, Syrphus Flies, Bot Flies and House Flies.

NOTE.—The Robber Flies (*Asilidæ*), the Forest Flies and Sheep Ticks (*Hippoboscidæ*), belong to Diptera.

The following questions may be given for the Families of Diptera :

SECTION I. (*Long-horned Flies.*)

Q.—Describe the characters by which the——are distinguished?

1.—Describe the mouth parts of the——?

2.—What are the habits of the larvæ of the——?

3.—In what position are the wings when the insect is at rest?

4.—Describe the antennal characters by which the —— are distinguished?

5.—Name the example (or examples) given of the —— in illustrations?

6.—Name the example (or examples) given of the larva of the —— in illustrations?

7.—Are the —— possessed of wings?

8.—Which of the terms "obtected" or "coarctate" is applied to the pupa of the ——?

### Mosquitoes.

Q.—Describe the characters by which the Mosquitoes are distinguished?

Q.—Nos. 1, 2, 4 and 5.

NOTE.—The antennæ of the Mosquitoes, Gnats, etc., are feathery-like.

### Gall Gnats.

Q.—Describe the characters by which the Gall Gnats are distinguished?

Q.—Nos. 3, 5 and 6.

NOTE.—The pupæ are coarctate. The larvæ are injurious to growing wheat.

### Crane Flies.

Q.—Describe the characters by which the Crane Flies are distinguished?

Q.—Nos. 5, 6 and 8.

NOTE.—Fig. 168; 1, larva; 2, pupa. Larvæ injurious.

### Fleas.

Q.—Describe the characters by which the Fleas are distinguished?

SECTION II. (*Short-horned Flies.*)

## Horse Flies.

Q.—Describe the characters by which the Horse Flies are distinguished?

Q.—Nos. 2, 4, 5, 6 and 8.

NOTE.—Fig. 230 ; a, larva ; b, pupa.

## Syrphus Flies.

Q.—Describe the characters by which the Syrphus Flies are distinguished?

Q.—Nos. 2, 5, 6 and 8.

NOTE.—Fig. 231 ; a, larva ; b, pupa. Larvæ beneficial.

## Bot Flies.

Q.—Describe the characters by which the Bot Flies are distinguished?

Q.—Nos. 1, 2, 4, 5, 6 and 8.

NOTE.—Fig. 233 ; 4, larva, dorsal view ; 5, larva, ventral view ; 6, younger larva ; 3, pupa.

Answer to question 6, Fig. 170 and Fig. 233, 4, 5 and 6,

## House Flies.

Q.—Describe the characters by which the House Flies are distinguished?

Q.—Nos. 1, 2, 4, 5, 6 and 8.

NOTE.—Answer to question 6, Fig. 64.

Q.—Describe the characters by which the Tachina Flies are distinguished ?

## CHAPTER XV.

Coleoptera. (*Beetles.*)

Q.—Into how many sections is this Order of insects divided, and name the characters by which each section is distinguished? A.—They are divided into four sections, as follows:

1. Section——have five joints in all of the feet.
2. Section——have five joints in the anterior and middle pair of feet and four joints in the hind or posterior pair.
3. Section——have four joints in all of the feet.
4. Section——have three joints in all of the feet.

Q.—Name the examples of the first, second, third and fourth Sections in the illustrations given? A.—The Goldsmith Beetle (Fig. 4), belongs to the first; the Darkling Beetle (Fig. 119) to the second; the *Prionus* Beetle (Fig. 227) to the third, and the True Lady Bird (Fig. 239) to the fourth. All the feet five-jointed. *Pentamera*, from the Greek numeral, *pente*, five, and *mera*, parts or pieces.

## Pentamera.

Q.—Into how many Sub-sections are the Beetles having five-jointed feet divided? A.—Into six Sub-sections.

Q.—By what characters are they distinguished from each other? A.—By the form of their antennæ.

Q.—Name the six Sub-sections and the forms of antennæ by which they are classified? A.—1st Sub-section, antennæ thread-like (*filiform*); 2d Sub-section, becoming thickened toward the tip, club-shaped (*clavate*); 3d Sub-section, bead-like, (*moniliform*); 4th Sub-section, comb-toothed (*pectinate*); 5th Sub-section, composed of plates at the tip (*lamellate*); 6th Sub-section, saw-toothed (*serrate*).

Q.—Name the examples given of the forms of antennæ by which the six Sub-sections are distinguished ? A.—1st, Fig. 94 ; 2d, Fig. 92 ; 3d, Fig. 249 ; 4th, Fig. 102 ; 5th, Figs. 100 and 101 ; and 6th, Fig. 99.

Q.—What are the food habits of Beetles of the following Sub-sections : 1st Sub-section ; five joints in all feet, antennæ thread-like (*filiform*) ? A.—Predaceous in both perfect and larva state, therefore beneficial.

Q.—2d Sub-section ; five joints in all the feet, antennæ becoming thickened at the tip (*clavate*) ? A.—They feed upon decayed vegetable or animal matter, therefore beneficial as scavengers.

Q.—3d Sub-section ; five joints in all the feet, antennæ bead-like (*moniliform*) ? A.—They usually feed upon decayed animal matter, therefore beneficial as scavengers.

Q.—4th Sub-section ; five joints in all the feet, antennæ comb-toothed (*pectinate*) ? A.—The larvæ feed upon decayed wood. The perfect insects feed upon the sap exuding from trees.

Q.—5th Sub-section ; five joints in all the feet, antennæ composed of plates at tip (*lamellate*) ? A.—They feed upon excrements, or upon plants.

Q.—6th Sub-section ; five joints in all the feet, antennæ saw-toothed (*serrate*) ? A.—A great number of the larvæ of this Sub-section live and feed within the stems or branches of shrubs and trees.

NOTE.—The termination *cornes*, as *filicornes*, *clavicornes*, etc., means thread-like, horned; club-horned, etc.

### SUB-SECTION I.

Q.—What are the characters by which the Beetles of this Sub-section are distinguished ?

NOTE.—Answer by giving the tarsal and antennal characters.

Q. Into how many Tribes is this Sub-section divided, and name them? A.—It is divided into two Tribes; 1st, Predaceous Ground Beetles, and 2d, Predaceous Water Beetles.

Q.—Name the Predaceous Ground Beetles? A.—Tiger Beetles and Ground Beetles.

### TRIBE I.

Q.—Describe the habits, etc., of Tribe I of this Sub-section?

Q.—Into how many Families is Tribe I of this Sub-section divided, and name them? A.—Two Families, Tiger Beetles and Ground Beetles.

Q.—Describe the characters by which the Tiger Beetles are distinguished?

Q.—Name the examples of the Tiger Beetles given in the illustrations?

Q.—Describe the habits of their larvæ?

Q.—Describe the characters by which the Ground Beetles are distinguished?

Q.—Name the examples of the Ground Beetles given in illustrations?

Q.—Describe the habits of their larvæ?

### TRIBE II.

Q.—Describe the habits, etc., of Tribe II of this Sub-section?

Q.—Into how many Families is Tribe II of this Sub-section divided, and name them? A.—Two Families, Divers and Whirligig Beetles.

Q.—Describe the characters by which the Diving Beetles are distinguished?

Q.—Name the example given in illustration?

NOTE.—The Beetle c, in illustration, Fig. 244, is the *Dytiscus fasciventris* (Say). The larva a, and pupa b, belong to the Margined Water Beetle, a species of the same genus.

Q.—By what letters are the larva, pupa, anterior feet of the male and female designated in Fig. 244?

Q.—Describe the characters by which the Whirligig Beetles are distinguished?

Q.—Describe their larvæ?

### SUB-SECTION II.

Q.—Describe the characters by which the Beetles of this Sub-section are distinguished?

NOTE.—Answer by giving the tarsal and antennal characters.

Q.—Into how many Tribes is this Sub-section divided, and name them? A.—It is divided into two Tribes: 1st, Water Scavenger Beetles, and 2d, Land Scavenger Beetles.

#### TRIBE I.

Q.—Describe the characters by which the Water Scavenger Beetles are distinguished?

Q.—Into how many Families are the Water Scavenger Beetles divided, and name them? A.—Two Families; Long Toed Water Beetles and Short Toed Water Beetles.

#### Long Toed Water Beetles.

Q.—Describe the characters by which the Long Toed Water Beetles are distinguished?

Q.—Describe their larvæ?

Q.—Describe the characters by which the Short Toed Water Beetles are distinguished?

Q.—Name the examples given in this illustration?

NOTE.—The larva, a, and pupa, c, are those of the Pitch Black Water Beetle, belonging to the same genus.

Q.—By what letters are the larva, pupa, anterior foot of male and female designated in Fig. 245?

*TRIBE II.*

Q.—Describe the habits of the Land Scavenger Beetles?

Q.—Into how many Sub-tribes are they divided? A.—Two.

**SUB-TRIBE I.**

Q.—What are the characters by which the Beetles of Sub-tribe I can be distinguished?

Q.—Into how many Families may Sub-tribe I be divided, and name them? A.—Two ; Burying Beetles and Museum Beetles.

Q.—Describe the characters by which the Burying Beetles are distinguished, and their food habits?

Q.—Name an example given in the illustrations?

Q.—By what letters are the pupa, larva, anterior foot of the Beetle, and antennæ of larva designated in Fig. 246? A.—Larva, a and d ; pupa, b and e ; anterior foot, k, and antennæ of larva, j.

Q.—Describe the characters by which the Museum Beetles are distinguished, and their food habits?

Q.—What example is given in illustration ?

Q.—Describe the larvæ of this Family ?

Q.—Name the letter designating the example given in illustration (Fig. 247) ?

**SUB-TRIBE II.**

Q.—What are characters by which this Sub-tribe can be distinguished, and what are their habits?

Q.—Name the principal Families of this Sub-tribe ? A.—Trojosita Beetles and Cucujus Beetles.

Q.—Describe the characters by which the Trojosita Beetles are distinguished, and their food habits?

Q.—Describe the characters by which the Cucujus Beetles are distinguished, and their food habits ?

Q.—Name the example of the Cucujus Beetle given in illustration ?

### SUB-SECTION III.

Q.—What are the characters by which the Beetles of this Sub-section are distinguished?

NOTE.—Answer by giving the tarsal and antennal characters.

Q.—What is the popular name given to the Beetles of this Sub-section ? A.—Rove Beetles.

Q.—Describe the characters by which the Rove Beetles can be distinguished?

Q.—What are their habits?

### SUB-SECTION IV.

Q.—What are the characters by which the Beetles of this Sub-section are distinguished ?

NOTE.—Answer by giving the tarsal and antennal characters.

Q.—Upon what kind of food do the Beetles of this Sub-section subsist?

Q.—Describe their larvæ ?

### SUB-SECTION V.

Q.—What are the characters by which the Beetles of this Sub-section are distinguished?

NOTE.—Answer by giving the tarsal and antennal characters.

Q.—Into how many Tribes is this Sub-section divided?  
A.—Five.

#### TRIBE I.

Q.—What are the characters by which the Beetles of Tribe I, of this Sub-section, are distinguished ?

Q.—Upon what kind of food do the Beetles of this Tribe live?

Q.—What is the popular name given the Beetles of this Tribe?

*TRIBE II.*

Q.—What are the characters by which the Beetles of Tribe II, of this Sub-section, are distinguished?

Q.—Upon what kind of food do the Beetles of this Tribe subsist?

Q.—Where do the larvæ of these Beetles live, and upon what kind of food do they subsist?

Q.—Name the the principal Families of this Tribe? A.—June Beetles, Grape-vine Beetles and Cetonians.

**June Beetles.**

Q.—Describe the characters by which the June Beetles are distinguished?

Q.—Upon what kind of food do the perfect insects of this Family subsist?

Q.—Name the examples of the June Beetles given in the illustrations?

Q.—Describe the larvæ of the June Beetles?

Q.—Upon what kind of food do the larvæ of the June Beetles subsist?

Q.—What figure indicates an example of the larvæ of the June Beetles given in Fig. 139? A.—Fig. 2.

**Grape-vine Beetles.**

Q.—Describe the characters by which the Grape-vine Beetles are distinguished?

Q.—Upon what kind of food do the perfect insects of this Family subsist?

Q.—Name the examples of the Grape-vine Beetles given in the illustrations? (The Goldsmith Beetle, Fig. 4, belongs to this Family.)

Q.—Describe the habits of the larvæ of this Family?

Q.—By what letter is the larva designated in Fig. 253?

### Cetonians.

Q.—Describe the characters by which the Cetonians are distinguished?

Q.—Upon what kind of food do these Beetles subsist?

Q.—Name the example of the Cetonian Beetles given in the illustration?

Q.—What is said of the habits of this Family of Beetles?

Q.—Upon what do the larvæ feed, and what letter designates the larva in Fig. 255?

### SUB-SECTION VI.

Q.—What are the characters by which the Beetles of this Sub-section are distinguished?

NOTE.—Answer by giving the tarsal and antennal characters.

Q.—Into how many Tribes is this Sub-section divided, and name them? A.—Three. 1st, Saw-horned Borers; 2d, Aberrant Wood Beetles; 3d, Soft-winged Beetles.

### Saw-horned Beetles.

Q.—Describe the characters by which the Saw-horned Beetles are distinguished?

Q.—Into how many Families are the Saw-horned Beetles divided, and name them? A.—Two. Buprestis Beetles and Spring Beetles.

Q.—Describe the characters by which the Buprestis Beetles are distinguished?

Q.—Name the examples given of this Family in the illustrations?

Q.—Describe the larvæ of this Family, and also state upon what kind of food they subsist?

Q.—Name the examples given in the illustrations ; also the letter designating the larva in Fig. 257? A.—Fig. 54. The Beetle which produces the Flat-headed Apple-tree Borer and the Raspberry Borer, Fig. 257, b.

### Spring Beetles.

NOTE.—These Beetles are also known by the *popular names* Skip-jack Beetles, Snapping Beetles, Click Beetles, etc.

Q.—Describe the characters by which the Spring Beetles are distinguished?

Q.—Name the examples given of this Family in the illustrations?

Q.—What is the popular name given to the larvæ of the Beetles of this Family?

Q.—Upon what kind of food do the larvæ subsist?

Q.—Name the example given of the larvæ of this Family in the illustrations? A.—Fig. 258, Wire Worms, 7, 8 and 9 ; Fig. 259, Glow Worms, a and b.

### TRIBE II.

Q.—Describe the characters by which the Beetles of this Tribe are distinguished?

Q.—Upon what kind of food do they subsist?

### Branch Borers.

Q.—Describe the characters by which the Branch Boring Beetles of this Family are distinguished?

Q.—Name the examples given of the perfect insects of this Family in the illustrations?

Q.—By what letter is the larva designated in Fig. 262?

### TRIBE III.

Q.—Into how many Families is Tribe III divided, and name them? A.—Two. Soft-winged Beetles and Lightning Beetles.

## Soft-winged Beetles.

Q.—Describe the characters by which the Beetles of this Tribe are distinguished?

Q.—What are their habits?

## Lightning Beetles

Q.—Describe the characters by which the Lightning Beetles are distinguished?

Q.—Name the examples given in illustration?

Q.—By what letter is the larva designated in Fig. 263?

A.—By the letter a.

SECTION II. (*Heteromera.*)

Five joints in the anterior and middle pairs of feet, and four joints in the posterior pair. The Beetles of this Section are termed *Heteromera*, from the Greek word *hetero*, meaning different, prefixed to *mera*, meaning pieces or parts.

Q.—Describe the characters by which the Beetles of this Section are distinguished? A.—By having five joints in the anterior and middle pair of feet and four joints in the hind or posterior pair.

Q.—Into how many Tribes is this Section divided, and name them? A.—Three; 1st, Parasite Beetles; 2d, Bark Beetles, and 3d, Ground Beetles.

## TRIBE I.

Q.—Describe the characters by which the Beetles of this Tribe are distinguished?

Q.—Name the Families given of Tribe I? A.—Blister Beetles and *Notoxus* Beetles.

## Blister Beetles.

Q.—Describe the characters by which the Blister Beetles are distinguished, and their food habits?

Q.—Name the examples given of the Blister Beetles in the illustration?

Q.—Upon what kind of food do the larvæ of these Beetles subsist?

Q.—Wherein does the genus *Meloe* differ from other genera of this Family?

Q.—Of what medicinal property are some of the genera of this family possessed?

NOTE.—Their antennæ are usually thread-like (*filiform*).

### Notoxus Beetles.

Q.—Describe the characters by which the Notoxus Beetles are distinguished?

Q.—Name the illustration given of this Family?

Q.—Upon what kind of food do they subsist?

### TRIBE II.

What is the popular name given to the Beetles of this Tribe? A.—Bark Beetles.

Q.—Describe the characters by which the Bark Beetles are distinguished, and also the habits of their larvæ?

### TRIBE III.

Q.—What is the popular name by which the Beetles of this Tribe are known? A.—Ground Beetles; but are all included in one Family, commonly known as the Darkling Beetles.

Q.—Describe the characters by which the Beetles of this Tribe are distinguished?

Q.—Describe the form, number of legs, etc., which the larvæ of the Darkling Beetle are provided with; also their food habits?

Q.—Name the examples given of the perfect insects and larva in the illustrations?

NOTE.—The letter "a" designates the larva, Fig. 265.

### SECTION III. (*Four Joints in all the Feet.*)

The Beetles of this section are termed *Tetramera*, from the Greek numeral *tetra*, four, prefixed to *mera*, meaning pieces or parts.

Q.—Describe a prominent character by which the Beetles of this Section are distinguished?

Q.—Into how many Tribes are the Beetles of this Section divided, and name them? A.—Four; 1st, Weevil; 2d, Short-horned Borers; 3d, Long-horned Borers, and 4th, the Plant Beetles.

#### TRIBE I.

Q.—Describe the characters by which the Beetles of this Tribe are distinguished?

Q.—Name the Families into which Tribe I is divided? A.—*Bruchus* Weevils and Snout Beetles.

#### Bruchus Weevils.

Q.—Describe the characters by which the *Bruchus* Weevils are distinguished?

Q.—Name the examples given in the illustrations?

Q.—Describe the larvæ and their food habits?

Q.—What letter designates the larva in Fig. 267? A.—Letter c.

#### Snout Beetles.

Q.—Describe the characters by which the Snout Beetles are distinguished?

Q.—Name the examples given of the Snout Beetles in the illustrations?

Q.—Describe the characters by which the larvæ of the Snout Beetles are distinguished, and their food habits?

Q.—Are the eggs deposited by the female of Snout Beetle on the surface of the fruit, etc.?

NOTE.—The letter "a," Figs. 271 and 274, designates the larvæ of the Snout Beetles.

#### Short-horned Borers.

Q.—Describe the characters by which the Short-horned Borers are distinguished?

Q.—What are the habits of their larvæ?

Q.—Name the examples of the Short-horned Borers given in illustration?

#### Long-horned Borers.

Q.—Describe the characters by which the Long-horned Borers are distinguished?

Q.—Name the examples given of the Long-horned Borers in the illustrations?

Q.—Describe the characters by which the larvæ of this Family are distinguished; also their food habits, etc.?

Q.—What letter designates the larva in Fig. 278?

#### TRIBE IV.

Q.—Describe the characters by which the Plant Beetles are distinguished?

Q.—Describe the characters by which the larvæ are distinguished, and their habits?

Q.—Name the examples given of the Plant Beetles in the illustrations?

Q.—What letters designate the eggs and larvæ in Fig. 282?

A.—a, eggs; b, the larvæ in different stages of growth.

Q.—What letters represent the larvæ in Fig. 283? A.—a, larvæ, natural size; b, larva magnified.

NOTE.—Fig. 288 represents the larvæ of the Tortoise Beetles.

SECTION IV. (*Three Joints in all the Feet.*)

The Beetles of this Section are termed Trimera, from the Greek numeral *tri* prefixed to *mera*, meaning pieces or parts.

Q.—Describe the characters by which the Beetles of this Section are distinguished?

## Lady Bird Family.

Q.—Describe the characters by which the Lady Birds are distinguished?

Q.—What are their food habits?

Q.—Name the examples given of the Lady Birds in the illustrations?

Q.—Describe Fig. 290? A.—a, larva; b, pupa; d, e, f and g, varieties of the Fifteen-spotted Lady Bird.

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## CHAPTER XVI.

HEMIPTERA. (*True Bugs.*)SUB-ORDER, HOMOPTERA (*Similar-winged Bugs.*)

Question—Into how many Families is the Sub-order Homoptera divided, and name them? Answer—Seven. Plant-lice, Mealy-winged Bugs, Scale Insects, Jumping Plant-lice, Leaf Hoppers, Lantern Flies and Harvest Flies.

## Plant-lice.

Q.—Describe the prominent characters by which the Plant-lice are distinguished?

Q.—What kind of food do they subsist upon, and on what parts of plants are they found?

Q.—Do they live in colonies?

Q.—Do they reproduce their kind from an egg?

Q.—What attracts the Ants and Flies to trees or plants infested by Plant-lice?

Q.—Name the illustrations given of the Plant-lice in the illustrations, designating those which represent the Winged-lice and those which represent the Wingless-lice? A.—Cabbage Plant-louse ; Fig. 24, 2, winged ; Fig. 24, 4, wingless. Fig. 158, Apple-tree, wingless. Hop-louse, Fig. 157, 2, winged ; 157, 4, wingless. Grain-louse, Fig. 291, 1, winged ; 291, 3, wingless. The Wooly Aphis, Fig. 292, c, winged ; 292, b, wingless.

#### Mealy-winged Bugs.

Q.—Describe the characters by which the Mealy-winged bugs are distinguished?

#### Scale Insect.

Q.—Describe the characters by which the Scale Insects are distinguished?

Q.—Name the examples given of the Scale Insects in the illustrations of this Chapter?

#### Jumping Plant-lice.

Q.—Describe the characters by which the Jumping Plant-lice are distinguished?

Q.—In what character do the antennæ of this Family differ from those of other Plant-lice? A.—The last joint terminates in two long bristles.

Q.—Name the examples given of the Jumping Plant-lice in the illustration?

#### Leaf Hoppers.

Q.—Describe the characters by which Leaf Hoppers are identified?

Q.—Name the examples given of the Leaf-hoppers in the illustrations?

## Lantern Flies.

Q.—Describe the characters by which the Lantern Flies are distinguished?

Q.—Name the example given in the illustration?

## Harvest Flies.

Q.—Describe the characters by which the Harvest Flies can be identified?

Q.—Describe their habits of oviposition, feeding, etc.?

Q.—Name the example given in illustration, and why it is so called?

Q.—Describe Fig. 300? A.—a, pupa ; b, empty pupa case ; c, perfect insect ; d, punctures in branch in which the Harvest Fly deposited eggs.

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## CHAPTER XVII.

## HEMIPTERA.

SUB-ORDER II. HETEROPTERA (*Dissimilar-winged Bugs*).

Question—Into how many Families is this Sub-order divided, and name them? Answer—Thirteen ; namely, Water Boatmen, Water Scorpions, Galgula Bugs, Water Measurers, Pirate Bugs, Chinch Bugs, Squash Bugs, Plant Bugs, Soldier Bugs, Thrips, Bed-bugs, Lice and Bird-lice.

Q.—Describe the characters by which the Water Boatmen are distinguished?

Q.—What are their habits?

Q.—Describe the Water Scorpions?

Q.—What are their habits?

Q.—Name the example given of the Water Scorpion in the illustrations? A.—The Large Belostoma, Fig. 134.

Q.—Describe the characters by which the Galgula Bugs are distinguished?

Q.—What are their habits?

Q.—Describe the characters by which the Water Measurers are distinguished?

Q.—What are their habits?

Q.—Describe the characters by which the Pirate Bugs are distinguished?

Q.—What are their habits?

Q.—Name the examples given of the Pirate Bugs in the illustrations?

Q.—Describe the characters by which the Chinch Bugs are distinguished?

Q.—What are their food habits, etc.?

Q.—Name the examples given of the Chinch Bugs in the illustrations?

Q.—Describe the characters by which the Squash Bugs are distinguished?

Q.—What are their food habits?

Q.—Name the examples given of the Squash Bugs in the illustrations?

Q.—Describe the characters by which the Plant Bugs are distinguished?

Q.—What are their habits, etc.?

Q.—Name the examples given of the Plant Bugs in the illustrations?

Q.—What is meant by *scutellum*? A.—A triangular piece attached to the posterior edge of the thorax, and extending between the bases of the elytra, or wing-cases, especially in Coleoptera and in some of Sub-order Heteroptera.

NOTE.—The only part visible from above of the third division of the thorax, to which the hind wings and hind pair of legs are attached.

Q.—What examples can you name in the illustrations given?

A.—Figs. 54, 20, 114, 118, 139, 237, 243 b, 246 c, 258 3, 304 and others?

Q.—Describe the characters by which the Thrips are distinguished?

Q.—What are their food habits?

Q.—Name the illustration given of the Thrips as larva, pupa and perfect insect? A.—Fig. 42, larva; 305, pupa; 161, perfect insect.

NOTE.—The perfect insect measure one twenty-second (1-22) of an inch in length.

Q.—Describe the characters by which the Bed-bugs are distinguished?

Q.—Describe their food habits?

Q.—Name the examples given of this Family in the illustration?

Q.—Describe the characters by which the Lice are distinguished?

Q.—What are their food habits?

Q.—Describe the characters by which the Bird-lice are distinguished?

Q.—What are their food habits, etc.?

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## CHAPTER XVIII.

### ORTHOPTERA.

Question—Into how many sections is this Order divided, and name them? Answer—Four; namely, Runners, Graspers, Walkers and Jumpers.

#### Runners.

Q.—Name the Families given of this section? A.—Earwigs and Cockroaches.

Q.—Describe the characters by which the Earwigs are distinguished?

Q.—Name the examples given of the Earwig in the illustration?

Q.—What are their food habits?

### Cockroaches.

Q.—Describe the characters by which the Cockroaches are distinguished?

Q.—What are their habits?

### Graspers.

Q.—Describe the characters by which the Graspers are distinguished?

Q.—Name the example given of this Family, and also of their eggs as deposited on a branch of a grapevine, etc.?

Q.—What is said of this Family as to their food habits?

### Walkers.

Q.—Describe the habits of this Family?

### Jumpers.

Q.—Name the Families into which this section is divided?

A.—Crickets, Katydids, Locusts or Brown Grasshoppers, Grouse Locusts and True Locusts.

### Crickets.

Q.—Describe the characters by which the Crickets are distinguished?

### Mole Crickets.

Q.—Describe the characters by which the Mole Crickets are distinguished?

## Tree Crickets.

Q.—Describe the characters by which the Tree Crickets are distinguished?

Q.—Where do the females deposit their eggs?

Q.—Name the examples given of the Tree Crickets in the illustrations? A.—Figs. 21 and 309.

Q.—Name the examples given of branches in which their eggs are deposited? A.—Figs 28 and 34.

NOTE.—Fig. 28, a, eggs deposited in the pith of a branch ; b, opening made by the female, through which the egg is thrust to the pith : c, an egg enlarged.

Fig. 34, a, branch representing punctures made in the bark ; b, branch representing eggs as laid in the wood ; c, egg magnified.

Q.—Describe the characters by which the Field Crickets are distinguished?

## Katydid or Green Grasshoppers.

Q.—Describe the characters by which the Katydid or Green Grasshoppers are distinguished?

Q.—Where do the Katydid deposit their eggs?

Q.—Name the illustrations given of the insect, eggs, etc.?

A.—Insect, Fig. 141. Eggs, Figs. 27 and 310.

## Locusts or Brown Grasshoppers.

Q.—Describe the characters by which the Brown Grasshoppers are distinguished?

Q.—What is said of the males?

Q.—Describe the characters by which the Sub-family termed Grouse Locusts are distinguished?

Q.—Describe the characters by which the Sub-family termed True Locusts are distinguished?

## CHAPTER XIX.

## NUEROPTERA.

Question—Name the Families into which this Order of insects is divided? Answer—White Ants, Fungus Flies, Perla Flies, May Flies, Dragon Flies, Sialis Flies, Lace-winged Flies, Scorpion Flies and Caddis Flies.

## White Ants.

Q.—Describe the characters by which the White Ants are distinguished?

Q.—What are their food habits, etc.?

## Fungus Flies.

Q.—Describe the characters by which the Fungus Flies are distinguished ; also their habits?

## Perla Flies.

Q.—Describe the characters by which the Perla Flies are distinguished ; also their habits?

## May Flies.

Q.—Describe the characters by which the May Flies are distinguished?

Q.—What is meant by sub-imago?

Q.—What are their habits?

Q.—Name the insects of the Order Hymenoptera which they resemble?

## Dragon Flies.

Q.—Describe the characters by which the Dragon Flies are distinguished?

Q.—Name the example given in illustration?

Q.—Describe the larvæ of this Family and their habits?

Q.—Into how many groups are the insects of this Family divided, and name them? A.—Two. 1st, Ag-ri-on-i-næ, and 2d, Li-bel-lu-li-næ.

Q.—Describe the characters by which the first group is distinguished?

Q.—Describe the characters by which the second group is distinguished?

#### Lace-winged Flies.

Q.—Describe the characters by which the Lace-winged Flies are distinguished?

Q.—Describe the transformations of the Lace-winged Flies?

Q.—Name the examples given of the perfect insect and larva in the illustrations?

Q.—What are the food habits of their larvæ?

Q.—Name another insect belonging to this Family that is predaceous, and the manner in which it captures its food?

#### Scorpion Flies.

Q.—Describe the characters by which the Scorpion Flies are distinguished?

Q.—What is said of their larva, etc.?

#### Caddis Flies.

Q.—Describe the characters by which the Caddis Flies are distinguished?

Q.—What are the habits of their larvæ?

## CHAPTER XX.

In the descriptions given in the foregoing chapters, the Orders were divided into Sections, Sub-sections, Tribes, Families, Groups and Sub-families. In order that the natural history and divisions of the Family Coccidæ, of the Sub-order Homoptera be better understood, the Sub-families will be divided into genera, so as to assist the pupil in understanding the classification of the Scale Insects.

Question.—Name the insects of which the Coccidæ Family is composed?

NOTE.—The pupil should memorize the part of chapter 20 on page 114, and all of page 115. Exuviae, or cast-off skin of the larva; see examples, center of 2a, Fig. 311, scale of female, and 2b, Fig. 311, scale of male.

Q.—Name the three Sub-families into which the Coccidæ is divided?

Q.—Name the genera which compose the first Sub-family, Diaspinæ? A.—Aspidiotus, Diaspis, Chionaspis, Mytilaspis, Parlatoria and Uhleria.

### Genus Aspidiotus.

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the examples given in the illustrations of the insects of this genus? A.—Fig. 293, Oleander leaves infested by Lemon Peel Scale-insect, 1, natural size; male insect, 1a; male Scale, 1b; female insect, 1c, enlarged. Fig. 311, Orange leaves infested by the Red Scale of Florida, 2; female Scale, 2a; male Scale, 2b; larva, 2c; (2, natural size; 2a, 2b, 2c, enlarged).

NOTE.—The Red Scale of Cal., Greedy Scale, San Jose Scale, Red Bay Scale and Oyster Shell Bark-louse belong to this genus.

Genus *Diaspis*.

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the example given in the illustration of the Rose Scale? A.—Fig. 312, rose branch infested by the Rose Scale, 1; female Scale, 1a; male Scale, 1b; (1, natural size; 1a and 1b, enlarged).

Q.—Wherein do Scale of this genus differ from *Aspidiotus*?

NOTE.—The Oyster Formed Scale-insect belongs to this genus.

Genus *Chionaspis*.

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Wherein do the insects of this genus resemble those of the genus *Diaspis* and *Mytilaspis*?

Q.—Name the examples given in the illustrations of the insects of this genus. A.—Fig. 313, branch infested by the Scurfy Scale-insects, 1; male Scales, showing insect, 1a; male insect, perfect, 1b; female insect and scale, 1c; (1a, 1b and 1c, enlarged; 1, natural size).

Genus *Mytilaspis*.

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Wherein do the scale of the male and that of the female differ?

Q.—Name the examples given in the illustration of the insects of this genus? A.—Fig. 314, orange leaf infested by the Citrous Scale-insect, 1; scale of females, dorsal view, 1a; scale of female with ventral scale and eggs, 1b; scale of male, 1c; (1, natural size; 1a, 1b and 1c, enlarged).

**Genus *Parlatoria*.**

Q.—Describe the characters by which insects of this genus are distinguished?

Q.—Name the examples given in illustration?

**Genus *Uhleria*.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name example given of this genus in illustration?

**Genus *Ceroplates*.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the examples given of this insect in the illustrations? A.—Fig. 317, the Florida Scale-insect on *Ilex*, natural size; 2c, young female, and 2b, adult female enlarged, Fig. 318, the Barnacle Scale; females, natural size, 3; female enlarged, 3a.

**Genus *Pulvinaria*.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—For what Group of insects was this genus erected?

Q.—Name the example given in the illustrations?

NOTE.—The Cottony Grape Scale belongs to this genus.

**Genus *Lecanium*.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the examples given in the illustrations? A.—Fig. 294, Black Scale on Olive, natural size; 1a, enlarged. Fig. 320, Filbert Scale; on leaf, natural size, 3; enlarged, 3a.

Fig. 321, Soft Orange Scale, natural size, with accompanying cut of female enlarged.

NOTE.—The flat soft Scales on the peach, pear, almond, elm, locust, and hot-house plants, belong to this genus.

**Genus Kermes.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the example given in the illustrations? A.—Fig. 322, adult female on stem, immature females on leaves.

**Genus Rhizococcus.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—By what characters are the male insects of this genus distinguished from the males of other genera?

Q.—What kind of covering does the female prepare for her eggs?

Q.—Describe the preparation made by the male larva previous to its entering the pupa state?

Q.—Name an insect belonging to this genus?

**Genus Dactylopius.**

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the examples given in the illustrations?

**Genus Pseudococcus.**

Q.—Describe the characters by which the insects of this genus are distinguished?

**Genus Coccus.**

Q.—Describe the characters by which the insects of this genus are distinguished from Dactylopius and Pseudococcus?

Q.—Name an insect belonging to this genus?

Genus *Icerya*.

Q.—Describe the characters by which the insects of this genus are distinguished?

Q.—Name the example given in illustration? A.—Fig. 295, female adult and young on orange leaf. Fig. 325, females and young on orange branch.

NOTE.—The Cottony Cushion Scale feeds upon all kinds of citrous and deciduous fruit trees, ornamental trees and shrubs.

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## CHAPTER XXI.

The pupil should be required to memorize the names of the insects given in this Chapter, so as to become familiar with such insects as are termed Beneficial.

The Tiger Beetles, Ground Beetles, Lady-birds, Mantis, Soldier Bugs. Lace-winged Flies, Syrphus Flies, Wasps, Ichneumon Flies, Chalcid Flies and Tachina Flies are described in the preceding Chapters.

NOTE.—The Chalcid Flies are very small (see cross lines representing natural size, Fig. 188).

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## CHAPTER XXII.

The directions for collecting and preserving insects, given in this Chapter, are intended to assist students and others commencing the study of Entomology, in making collections of insects for classification, etc.

## TABLE OF TECHNICAL NAMES.

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Ab-do-men,	Chal-cid-i-dæ,
A-che-mon,	Chi-on-as-pis,
A-crid-i-dæ,	Chrys-id-i-dæ,
A-crid-i-næ,	Chrys-o-mel-i-dæ,
Æ-ger-i-dæ,	Ci-ca-di-dæ,
A-leu-rod-i-dæ,	Ci-cin-del-i-dæ,
Am-bu-la-to-ri-a,	Cis-tel-i-dæ,
An-ten-na (sing.),	Cla-vate,
An-ten-næ (pl.),	Clyp-e-us,
A-phid-i-dæ,	Co-arct-ate,
A-phod-i-dæ,	Coc-ci-dæ,
As-pi-di-o-tus,	Coc-ci-næ,
Ar-tic-u-la-ta,	Coc-cin-el-li-dæ,
Blat-ti-dæ,	Coc-cus,
Bom-byc-i-dæ,	Co-coon,
Brach-y-ce-ra,	Co-le-op-ter-a,
Bru-chi-dæ,	Cop-ri-dæ,
Bu-pres-ti-dæ,	Co-re-i-dæ,
Can-tha-ris,	Cu-cuj-i-dæ,
Cap-i-tate,	Cu-lic-i-dæ,
Cap-si-dæ,	Cur-cu-li-on-i-dæ,
Car-a-bi-dæ,	Cur-so-ri-a,
Ce-ci-do-my-i-dæ,	Cy-nip-i-dæ,
Cer-cop-i-dæ,	Dac-tyl-op-i-us,
Ce-ro-plas-tes,	Der-mes-ti-dæ,
Ce-ram-byc-i-dæ,	Di-as-pi-næ,
Ce-ton-i-dæ,	Di-as-pis,

Dip-ter-a,	Hy-per-sto-ma,
Dor-sum,	Ich-neu-mon,
Dy-tis-ci-dæ,	Ich-neu-mon-i-dæ,
E-la-ter-i-dæ,	I-ma-go,
E-pi-cau-ta,	Ker-mes,
E-phem-er-i-dæ,	La-bium,
Fe-mur,	La-brum,
Fil-i-form,	Lach-nos-ter-na,
Fla-bel-late,	Lam-el-late,
For-fic-u-lar-i-dæ,	Lam-pyr-i-dæ,
For-mic-i-dæ,	Lar-va (sing.),
Ful-gor-i-dæ,	Lar-væ (pl.),
Fu-si-form,	Le-can-i-næ,
Gal-gu-li-dæ,	Le-can-i-um,
Gen-e-ra (pl.),	Lep-i-dop-te-ra,
Ge-nic-u-late,	Li-bel-lu-li-dæ,
Ge-nus (sing.),	Lin-gu-la,
Ge-o-trup-i-dæ,	Lo-eus-ti-dæ,
Gril-li-dæ,	Ly-cæn-i-dæ,
Gy-ri-ni-dæ,	Ly-gæ-i-dæ,
Haus-tel-la-ta,	Lyt-ta,
Hem-e-ly-tra,	Mal-lo-phag-i-dæ,
Hem-e-ro-bi-dæ,	Man-dib-u-la-ta,
He-mip-te-ra,	Man-ti-dæ,
Hes-per-i-dæ,	Max-il-la (sing.),
Het-er-oc-e-ra,	Max-il-læ (pl.),
Het-er-om-er-a,	Mel-an-dry-i-dæ,
Het-er-op-ter-a,	Me-lo-i-dæ,
Ho-mop-te-ra,	Mel-o-lonth-i-dæ,
Hy-dro-met-ri-dæ,	Mem-bra-na-ce-i-dæ,
Hy-dro-phil-i-dæ,	Mes-o-tho-rax,
Hy-men-op-te-ra,	Met-a-mor-pho-ses,

Met-a-tho-rax,	Pi-er-i-dæ,
Mol-lus-ca,	Pi-lif-er-ous,
Mo-nil-i-form,	Pom-pil-i-dæ,
Mus-ci-dæ,	Pro-bos-cis,
Myt-il-as-pis,	Proc-tu-trup-i-dæ,
Nem-oc-er-a (or e-ra),	Pro-tho-rax,
Nep-i-dæ,	Pseu-do-coc-cus,
Neu-rop-te-ra,	Pso-ci-dæ,
Noc-tu-i-dæ,	Psyl-li-dæ,
No-to-nec-ti-dæ,	Pte-roph-or-i-dæ,
Nymph-al-i-dæ,	Pu-pa (sing.),
Ob-tect-ed,	Pu-pæ (pl.),
Oc-ci-put,	Pu-lic-i-dæ,
O-cel-li (pl.),	Pul-vi-na-ri-a,
O-cel-lus (sing.),	Py-ral-i-dæ,
Œ-soph-a-gus,	Quer-cin-a,
Œs-tri-date,	Ra-di-a-ta,
Or-thop-te-ra,	Rap-to-ri-a,
Pal-pi (pl.),	Re-du-vi-dæ,
Pal-pus (sing.),	Rho-pal-oc-er-a,
Pa-nor-pi-dæ,	Rhi-zo-coc-cus,
Pa-pil-i-on-i-dæ,	Ru-gose,
Par-a-glos-sa,	Ru-til-i-dæ,
Par-la-to-ri-a,	Sal-ta-to-ri-a,
Par-ni-dæ,	Sco-lyt-i-dæ,
Pec-ti-nate,	Scu-tel-ler-i-dæ,
Pe-dic-u-li-dæ,	Ser-rate,
Per-li-dæ,	Se-ta-ceous,
Pen-tam-er-a,	Si-al-is,
Pha-læn-i-dæ,	Silph-i-dæ,
Phil-am-pe-lis,	Spir-a-cle,
Phryg-an-i-dæ,	Sphing-i-dæ,

Staph-y-lin-i-dæ,	Tip-u-li-dæ,
Stri-æ,	Tor-tric-i-dæ,
Sut-ure,	Tra-che-a,
Syrph-i-dæ,	Tri-me-ra,
Ta-ba-ni-dæ,	Tro-chan-ter,
Tach-i-na,	Trog-os-it-i-dæ,
Ten-e-bri-on-i-dæ,	Tu-ber-cle,
Ter-mit-i-dæ,	Uh-le-ri-a,
Tet-tig-i-næ,	U-ro-cer-i-dæ,
Te-tram-er-a,	Ven-ter,
Tho-rax,	Ver-te-bra-ta,
Thrip-i-dæ,	Ves-pi-dæ,
Tib-i-a,	Vi-vip-a-rous,
Tin-e-i-dæ,	Zy-gæn-i-dæ.

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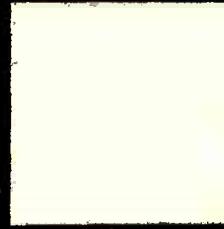
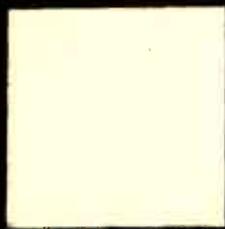
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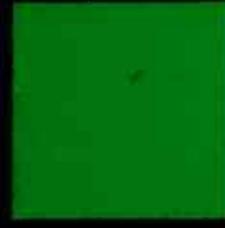
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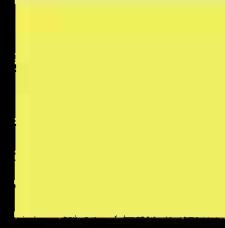
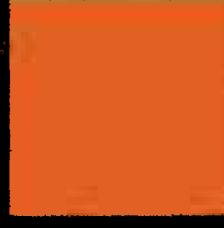
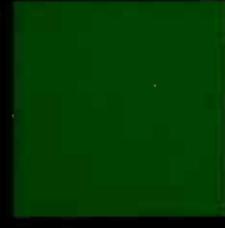
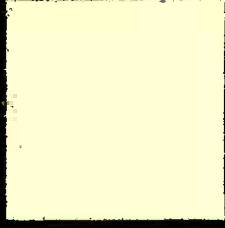
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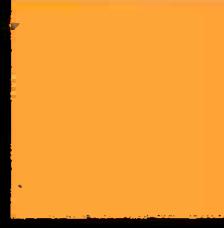
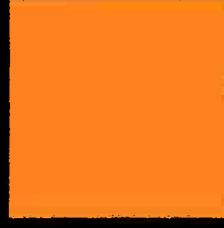
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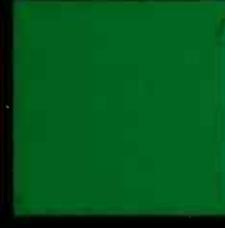
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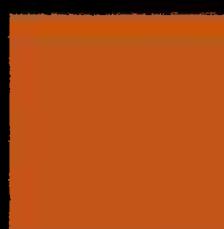
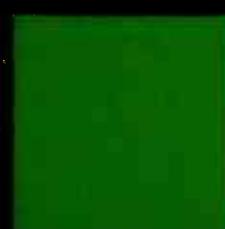
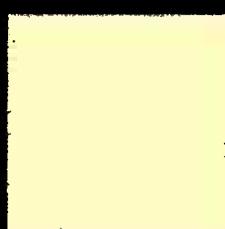
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